The

Electrical Review

VOL. XCVIII. JUNE 11, 1926. No. 2,533

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

Chairman: H. ALABASTER.

Technical Editor: A. H. ALLEN, M.I.E.E. *Joint Managing Directors:* G. H. ALABASTER. E. A. GATEHOUSE, M.I.E.E. A.M.INST.C.E. *Commercial Editor:* A. H. BRIDGE.

Manager and Secretary: E. S. MIDDLETON.

OFFICE: 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address: "AGEEKAY, CENT., LONDON," Code, A B C. Telephone No.: Central 7672 (Three Lines).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

LIST OF FOREIGN AGENTS (see first page "Official Notices").

Contents:

	PAGE
Electricity Supply Legislation	857
State Ownership—or Public Control?	858
Safety First Records	859
Trade Difficulties	859
Electricity in the Service of Women	859
Electricity Supply Undertakings (*illus.*)	860
The Insulating Properties of Fused Basalt (*illus.*)	862
CO_2 Records and their Interpretation, by Chas. F. Wade (*illus.*)	863
Concerning High-tension Batteries for Radio Sets, by Paul D. Tyers	865
The Electricity Policy of the French Government, by Theodore Rich	866
The N.E.L.A. Convention at Atlantic City	867
Business Notes	869
Lighting and Power Notes	872
Tramway and Railway Notes	874
Telegraph and Telephone Notes	874
Radio Notes	874
Contracts Open and Closed	875
Forthcoming Events	876
Notes	877
Institution Notes	879
Our Personal Column	879
New Companies Registered	880
Official Returns of Electrical Companies	880
City Notes	881
Stocks and Shares	883
Windmill Electricity Generators	885
The Electrical Imports of Spain	886
The Electricity (Supply) Bill (*continued*)	887
Radio-communication	888
Selected Radio-telephone Apparatus (*illus.*)	889
An Experiment in "Customer-Ownership," by R. E. Turnbull	890
The Water-power Resources of Canada	890
Electric Fans (*illus.*)	891
Russian Notes	892
A New Form of Electric-hydraulic Steering Gear, by H. S. Hele-Shaw and T. E. Beacham (*illus.*)	893
Legal	893
Correspondence—	
The Resistance and Heating of Plunger-type Lampholders	894
Earth Tubes in Radio Sets	894
The Electrical Association for Women	894
Reviews	895
Parliamentary News	896
Trade-Mark Applications	896
Published Specifications	896
Contractors' Column	Advertisement page xxxiv

Electricity Supply Legislation.

ON June 3rd, after a fortnight's recess, Standing Committee C resumed consideration of the Electricity (Supply) Bill; on the same day there appeared in *The Times* a trenchant criticism of its proposals, signed by nine men in the front rank of the electricity supply industry, which we reproduce elsewhere in this issue. In the main the letter is identical in tenor with the views that we have expressed in these columns—that the cost of the proposals for general standardisation and interconnection would impose an additional burden upon the consumers of electricity, and that the Bill in its present form will not effect the desired result of developing the use of electricity. It is added that its provisions tend to diminish efficiency by unnecessary interference, to introduce further bureaucratic administration without financial responsibility, and to discourage private enterprise.

With the exception of Mr. R. A. Chattock, president I.E.E. and head of the Birmingham Corporation Electricity Department, all the signatories are chairmen or engineers representing important undertakings owned by companies. Mr. Chattock, it will be remembered, set forth his views at much greater length in a manifesto which was published in our issue of April 30th last (p. 719); he then pointed out that if there were just grounds for the complaint that the supply undertakings had not adequately developed the industry, it was rather due to hampering legislation than to the shortcomings of the undertakings, and he cited the delay in granting facilities for extensions of area and the difficulty in obtaining wayleaves for overhead lines as instances which called for remedy. The machinery of the Bill, he considered, would only aggravate the troubles of the existing situation, and he appealed for freedom from interference with undertakings owning big generating stations. His suggestion that the Central Board, as middle-man, should be content with purchasing energy from the existing large power stations and retailing it to outside distributing authorities was an important item of constructive criticism which should receive full consideration; it would go far to appease the opposition of the great power companies and municipal under-

takings, and would obviate the absurdity of buying energy and reselling it to the producers at a price in all probability higher than the purchase price. Mr. Chattock also endorsed our contention that whilst regional interconnection is desirable and economically sound, there is no justification for national interconnecting lines. A further valuable suggestion of his was that in a station of non-standard frequency, additional generating plant of standard frequency could be installed, which would serve the purpose of interconnection whilst sharing in the high economy of the whole station. His statement, as a whole, deserves the most careful attention, and if, as Lt.-Col. Ashley stated at the E.A.W. luncheon last Friday, the Government is prepared to consider any suggested improvement, with a view to obtaining the best possible Bill, it cannot do better than begin with this well-weighed essay.

We have already drawn attention to the important resolution adopted by the I.M.E.A. in special general meeting on May 28th, condemning both the Bill and the Weir Report; in view of the enormous interests represented by this Association and the Parliamentary influence exercised by the municipalities concerned, the resolution is certain to receive the serious attention of the Government. It is not without interest to recall that the whole trouble derives its origin from the legislation of 40 years ago, which was welcomed by the municipalities whose representatives are now, in chorus with the companies, declaiming against the Government's Bill.

One point upon which all, including supporters of the Bill, are agreed is that it is most important to put an end as soon as possible to the uncertainty created by the patchwork legislation of recent years; as Mr. R. P. Sloan remarked at the E.A.W. luncheon, when justifying the attitude of the opponents of the Bill, there has been excessive legislation and constantly recurring uncertainty in the past, and what the industry most needs is a rest, so that it can "get on with the job." The splendid development which has been accomplished in the North-East Coast area is ample vindication of his policy and authority for his right to offer constructive criticism. Mr. W. B. Woodhouse, in a recent article published in the *English Review*, has set forth his considered opinions, many of which are so closely in accord with those which we have expressed in these columns that to quote them would be tautological. We must refer also to the resolution of the Council of the Institution of Electrical Engineers, in concluding that it is abundantly clear that there is a mass of reasoned opposition to the Bill—in its present form—emanating from the whole of the electricity supply industry; a large number of manufacturers and many prominent business men are also opposed to its provisions, and its progress in Committee is marked at every step by detailed arguments of which, unfortunately, we can only find room for an outline. Those who wish to follow this very instructive discussion more closely will find it fully set forth in the "Official Reports" of the proceedings of Standing Committee C, which can be obtained from H.M. Stationery Office at trifling cost, a day or two after each sitting. Provided that the Government is sincere in its expressed willingness to improve the Bill by amendment—and it has already accepted a most important change in the relationship between the Central Electricity Board and the Electricity Commission—we have strong hopes that in the end a really useful measure will be placed on the statute-book. But we take this opportunity of again pointing out that amendment of existing provisions is insufficient; the omissions are no less important, and it is urgently necessary to insert additional clauses drastically changing the situation with regard to wayleaves, the powers of the Postmaster-General, and other obstacles to the extension of distribution networks. **The Bill, as we have previously said, deals only with generation, which represents but a small fraction of the total cost to the consumer; unless it is so framed as to reduce the cost of distribution, it can have but little effect on the ultimate cost, and that fact is the most damning of all—for it means that the Bill, as it stands, fails to effect its most fundamental purpose.**

State Ownership—or Public Control?

WHETHER it be a question of coal mines, electricity supply, transportation, or telephone service, the people who think, and are not, as the Americans say, "dead from the neck up," are unanimously concerned to-day in settling once and for all the vexed question of industrial ownership. The absence of clear thinking on the subject in this country is largely the cause of high taxation and low wages, resulting in strikes, unrest among all classes, and positive misery in some cases.

In our report of the N.E.L.A. convention on another page we quote some striking words by that eminent authority on industrial relationships, Mr. Owen D. Young, who is chairman of the General Electric Co. of America. Mr. Young, who has studied for thirty years the war that has been waged between "public ownership" and "private ownership," sums up his conclusions in no uncertain manner in the speech to which we have referred. He concludes that efficiency and economy of operation are best attained by private ownership, and that a Governmental organisation is an inefficient and uneconomical instrument to do public utility business. Moreover, where there are no economic checks, political expediency tends to lead to extensions as an uneconomic social act rather than as a result of investigations leading to a paying business proposition. The rapid advance of the light and power supply industry in the United States is the envy of every foreign country, and the benefit of such a development is found in the solution of labour problems. If human beings are made the controllers of power instead of the generators their earning power is so much increased as to make it possible to pay them not only a living wage, but a cultural wage.

The high standard of living of all classes in the United States is evident to the most casual observer, and the recent delegation of British Trade Unions saw that the reason lay largely in the extensive use of machinery and labour-saving devices and the initiative displayed in American business organisation. As Mr. Mellon, the Secretary of the Treasury at Washington, has said: "An industry cannot pay high wages even under threats of strikes unless that industry is prosperous. Labour, as well as capital, must think constructively and in harmony. By the investment of capital in labour-saving machinery the production per man is so much increased that increased wages may accompany increased profits." But this means operation on the grand scale, and as Mr. Mellon goes on to say: "Corporations are no longer owned by a small number of individuals. In the United States there are 19 million holders of stock in industrial concerns, many of them persons of small means, who can secure a better and surer return on their money through investment in some useful well-organised company than in any other way."

In this connection we noticed a short time ago that the American Telephone and Telegraph Co., which has 350,000 shareholders on its books with less than a hundred shares each, and over 100,000 holding less than five shares each, has recently issued additional stock which brings its total capital to over a thousand million dollars, and the efficiency of the telephone service in the United States controlled by this huge private enterprise is second to that of none in the world. The article by Mr. R. E. Turnbull on "Customer-Ownership," on p. 890 of this issue is also very pertinent to this subject.

Private initiative is at the foundation of America's prosperity to-day, and although there exist many Government agencies to protect the public against abuses, this is quite a different thing from Government ownership or subsidy.

As we said earlier, our greatest need is for clear thinking. The relative merits of municipal and private ownership of means of transportation should not be confused with the relative technical merits of tramcars and 'buses; nor in a dispute, whether on coal mines or telephones, should we assume that either disputant is entirely in the right. He probably never is. Let us

get it definitely established that an interested employé gives better service than a disinterested one, and that a combination of employers and employés forming an industry must stand or fall on its merits as the result of co-operative service to the public, and we shall have gone far towards reaching a settlement of some of our present-day industrial problems.

Safety First Records.

A REPORT received from the American Museum of Safety bears striking witness to the immense importance of accident prevention; it relates to the records of organised precautions against accident in the works of the United States Steel Corporation over a period of 20 years. The figures are, of course, imposing in their magnitude because of the enormous scope of the company's operations, and the large number of its employés, but after allowing for this factor it cannot be doubted that very great benefit has been derived by both employers and employed from the safety movemen.

It is stated, on a statistical basis, that in 20 years 46,000 men have been saved from death or serious injury, and 322,000 from accidents which would have resulted in disablement; a very large saving in money has also been made. These data represent reductions of over 60 per cent. in the former class, and over 80 per cent. in the less serious class of accident. Nearly 10 millions sterling has been spent on measures to promote safety and sanitation in the last 14 years.

It is very significant that accidents due to hazards peculiar to the steel industry, such as hot metal and flame, accounted for less than 5 per cent. of the total, and only 4.9 per cent. were due to machinery; nearly half of the accidents were due to hand labour, which cannot be controlled by mechanical safety appliances. The inference is that, as is shown by our own records of accidents in coal mines, &c., a very large proportion of cases arise from carelessness and inattention, which can only be remedied by educating the workman to protect himself. The adoption of improved methods of lighting, heating, and ventilation also goes a long way to improve the safety records—bad lighting is one of the most potent factors in swelling the list of accidents in workshops.

By spending two millions on accident prevention in 10 years the U.S. Steel Corporation states that it saved three millions, apart from the enormous saving of life and limb.

Trade Difficulties.

IT is no easy task to make new suggestions of practical value regarding the development of our industries while they still lie under the heavy shadow cast by the coal dispute. For years past we have ransacked our own and others' brains in search of solutions of our problems, and pens have run dry setting forth reasons for this, criticisms of that, grounds for hope, and reproofs of pessimism. Committees have investigated and reported, trade and other associations have deliberated and acted, and then, years after, our spokesmen have delivered speeches containing practically the same ideas as we listened to from their predecessors when things were very different. The explanation seems to be that there is really very little new to say in spite of the altered times—practically everything has been said. That, we suppose, is why Mr. A. M. Samuel, M.P., the Parliamentary Secretary to the Department of Overseas Trade, in addressing the Iron and Steel Institute's members last week, reiterated once more the familiar remarks about the need for loyal and efficient labour to work hand in hand with sympathetic managers; for up-to-date equipment and wide-awake selling organisations; for the ingenuity of the technical expert, and the individuality and initiative of the business man; for increased attention to be devoted to research; for overseas agencies to be strengthened and methods of sale attended to; and for engineering firms to be in personal contact with customers abroad through representatives possessing knowledge of our products and armed with authority to act. Yet familiar as these points are, not one of them is of less importance to-day than it has been in the past. However substantial may have been the improvement made as the result of efforts of the past decade, there is still need for something more; probably there always will be. Sometimes we make changes which we genuinely regard as advances; perhaps experience proves them to be otherwise, or some new hand takes command and old ideas are revived and given a chance. Compared with foreign competitors we may or we may not have advanced in our method—such things are very difficult to measure, for we are all constantly changing. Really it is better to get on with the job than to sit talking about it. To be as efficient as possible in every department is what is required, but all such thoughts and ambitions must inevitably drive us back to the question of the cost of production, for we cannot continue to hold existing business or regain lost trade if we indefinitely shelter under the sentimental or the artificial. If the coal dispute is teaching the nation one thing more than another it is the inevitability of the economic truth that if we try to take out of an industry more than it will yield, that industry, like any little shop or other business, must shut down. The position of the general engineering trade, in which, as everybody recognises, the wages of skilled men are deplorably low, affords examples of the way in which some of the biggest concerns are being compelled to adjust their affairs in order to accommodate themselves to the circumstances of these trying years. While things so continue, it is impossible to force higher wages without further crippling the industry. It is unfortunate, and opposed to everybody's wishes that good work should be poorly paid, and no humane or social organisation can feel more deeply on the point than we do, but we believe that the truth regarding economic inevitabilities is becoming more widely recognised and both sides are more familiar with each other's difficulties. Now that the atmosphere is clearer than it was before the general strike, we ought all to be pulling together to bring our suffering industries round, but even these seem to be little better than idle words until the coal trouble is at an end.

Electricity in the Service of Women.

ON Friday last the first annual general meeting of the Electrical Association for Women was held and was followed by a luncheon to which were invited many distinguished men associated with electricity supply. The occasion was described by Alderman Mrs. Hammer (chairman of the Association) as its first official birthday, and we have the greatest pleasure in wishing it many happy returns; for the Association, which has for its object "the promotion of the wider use of electricity in the service of women," has another aspect, no less laudable—the wider use of women in the service of electricity, and from both points of view we heartily welcome it as a permanent and pleasing addition to the great electrical family.

The Association has made remarkably rapid progress during its short life of 18 months and, as Lt.-Col. Ashley observed, it is a very vigorous infant. The same speaker emphasised the fact that selling electricity was as important as generating it, and held that the reason why electricity in the home was a commonplace in the United States and Canada, whilst it was the exception here, was that in America the selling side of the business had been more efficiently conducted. That, as we have often pointed out, is the truth; and we look to the "E. A. W." to put a new face on the matter, by educating women in the art of utilising electricity to lighten labour and brighten the home. As Sir Hugo Hirst remarked, there is great scope for women not only to sell electrical home appliances to women, but also to carry on that continual *service* which is absolutely essential to success, and which will involve a serious course of training, but will ensure them remunerative employment.

The Association is in excellent hands, and will command success by deserving it.

Electricity Supply Undertakings.

The Effect of Load Factor.

(Communicated.)

DURING the current year two articles have appeared in these pages, analysing from different points of view the statistics of returns of the Electricity Commission for the year ended March 31st, 1923.*

The first article showed that on the average no clear decrease in coal consumption per kWh generated accompanied an increase of output beyond about 10 million kWh per annum, and the second indicated that very little difference in average price could be detected when the output rose above the same figure.

These two pioneer investigations, to which the present author is indebted for inspiration, were, quite naturally, a spur to further effort, and out of the mine of information contained in the statistics referred to, a

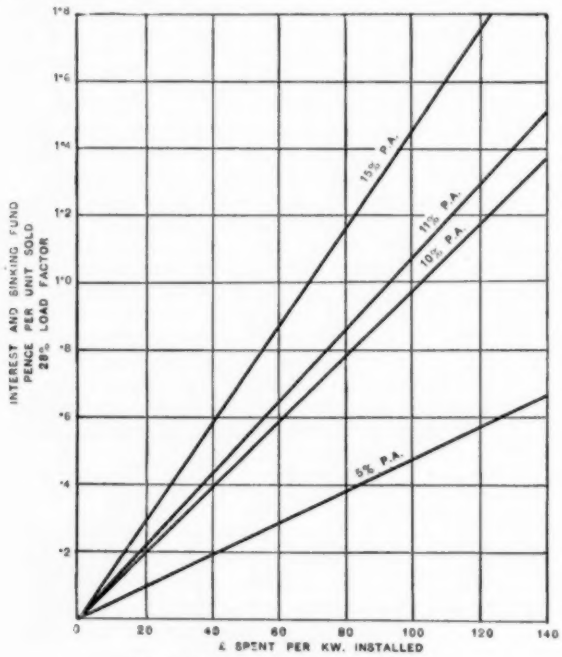


Fig. 1.—Cost of Plant and Capital Charges.

further search for instruction has been made. Following a preliminary investigation, it was decided, if possible, to trace the correlation, if any, of load factor and output as well as load factor and price per unit sold.

Load factor, it is perhaps needless to say, is the ratio of the mean to the maximum load observed upon any producing and/or distributing plant, be it either farm, factory, or electricity undertaking. The importance of cultivating, so far as possible, a full and continuous use of capital already expended, whether in the shape of farming implements, tools, steam, or electrical plant, and at the same time of arranging that all hands are well and effectively engaged, has, wherever prosperity is wooed, been fully recognised for generations. Such full use of capital and labour has for natural reasons some limitations, not the least being that man must sleep, and generally prefers to do so for 8 hours at night time.

Turning now to what may be expected in electricity undertakings, not only is load factor affected by natural causes, but it is found to be further influenced by working hours being normally concentrated within a part of the remaining 16 hours of the day. It must be remembered, too, that, although light, heat, and power are needed for purposes of recreation and pleasure, these agents are not called upon to render service with the same degree of intensity as in the process of creation and production.

* ELEC. REV., Jan. 1st, 1926, p. 5, and Feb. 5th, p. 204.

The cost of producing and distributing electrical power is itself a product of operating and capital costs, and both of these in turn are affected by load factor. As to operation, the lower the load factor the greater becomes the percentage of stand-by losses both in respect of coal and staff. Banking of boilers, radiation from steam pipes and steam plant may be cited as examples of heat losses, and unused attentiveness of skilled operators as an instance of the latter loss. The advent of pulverised fuel will, no doubt, greatly diminish the really serious operating charge of banking, but it is possible to conceive that even this may be done at too great a capital cost.

As to capital costs, these are the real and important burden, and no relief appears in sight. The value of individual savings collected and directed towards safe investment is not less than that indicated by a return of 5 per cent. on the money lent, and it is unwise at present to base any calculation of the return due to capital, in the shape of interest and of redemption, at less than 10 per cent. or 11 per cent., even when such capital is so well secured as in undertakings for the generation and distribution of electricity.

The total sum charged to capital account by electricity supply undertakings coming within the purview of the Electricity Commissioners' report was, up to 1923, approximately £158,000,000, the load factor being on the average about 28 per cent., the units sold 3,762 millions, and the total capacity of the generating plant installed about 3,100,000 kW. From this it is evident that the average cost per kW installed is £51, and the charge on each unit for capital purposes at this l.f. is not less than 0.5 of a penny (see fig. 1).

Since it is imperative to bring down the total cost of the unit, as made up of capital and operating costs, to very little over 0.5 penny, if the country is successfully to secure markets at home and abroad, the magnitude of the task upon which the electricity supply industry is engaged will be realised. It almost looks as if certain of our undertakings (unnamed) may shortly be faced with the necessity of reducing their charges for electricity and, as a consequence, will be faced with sacrifice of capital, or, alternatively, some of the interest thereon.

Reverting to the general question of load factor, one of the greatest obstacles in the way of decreasing the cost of electricity is the interest and sinking fund which must be found for capital lying idle so many hours of each day.

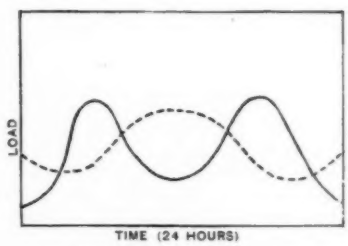


Fig. 2.—Diverse Load Curves.

The mean load, as is also well known, may in one industry be made up of demands varying in time and degree of intensity as compared with that of another industry, and although the same low load factor is found in each case when run separately, an improved result may be anticipated when they are run together. The curves in fig. 2 illustrate this point, the extent of the variation in time and intensity being commonly referred to as the diversity factor.

Turning, then, to the relation between load factor and output under examination, it might be supposed

that as a power station grew in size and the original early lighting supply was followed by power supply, traction load, and delivery of electricity in bulk, quite a marked increase in load factor would follow. As a matter of fact, as will be seen from fig. 3, continued on fig. 4, no such marked change is to be noted. Certainly, between outputs of 200,000 and 6,000,000 units per annum there is a well defined rise, but for greater outputs ranging from the latter figure to 186,000,000 units, little material change can, in any definite way, be detected. The analysis, it is true, relates only to undertakings run by English local authorities, but it is sufficiently indicative and no doubt reflects the true state of affairs not only of all local authorities, but also of company undertakings. This uniformity is interesting: can it be that there is a somewhat low limit to load factor following more or less the limits of human activity or endurance during a normal period of 24 hours? It would seem that unless hours of toil and amusement—especially the former — are materially extended, a maximum load factor of much over 50 per cent. and a mean of over 30 per cent. need not be expected. Such a high figure as 50 per cent. is to be found occasionally on suburban railway and tramway undertakings, but on the whole it would appear optimistic to expect throughout the length and breadth of the land anything above an average of 30 per cent. The reader must be left to draw his own deductions, but in extracting the figures determining the relationship under review, it should be recorded that no rise in load factor can be attributed positively to an increase in the ratio of electricity supplied for domestic plus public lighting requirements, to electricity supplied for power, traction and bulk supply, when such ratio is anything between 1 to 1 and 1 to 10. Apparently diversity of supply does not influence load factor as greatly as has hitherto been accepted. This is undoubtedly a matter of interest to engineers at the present moment, and raises a question as to the wisdom of effecting interconnection of two or more power stations operating in industrial centres placed in widely-separated parts of the kingdom, and in which it has been shown that, when individually operated, no increase in load factor has occurred with increases in output as made up of the many varieties of supply found in such centres. In other words, if load curves coincide the economies interconnection might introduce will be reduced to those of lessening the amount of spare plant required and some

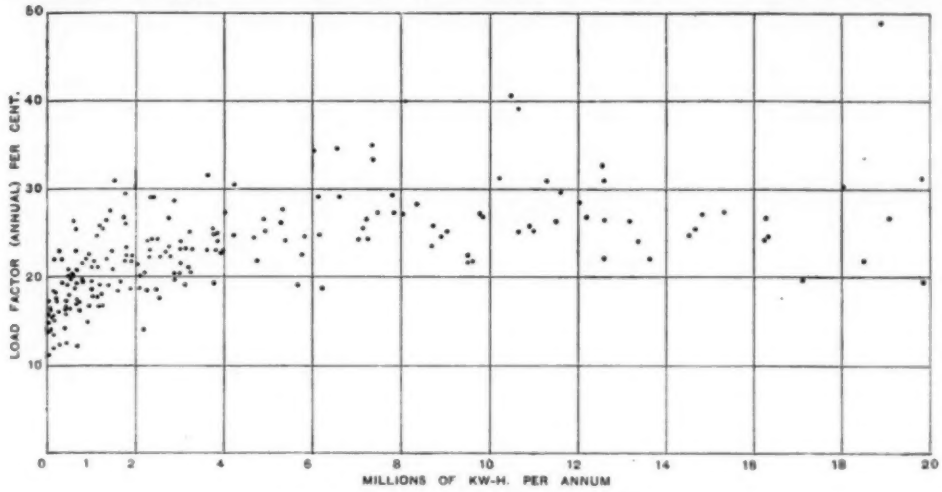


Fig. 3.—Relation between Load-factor and Output.

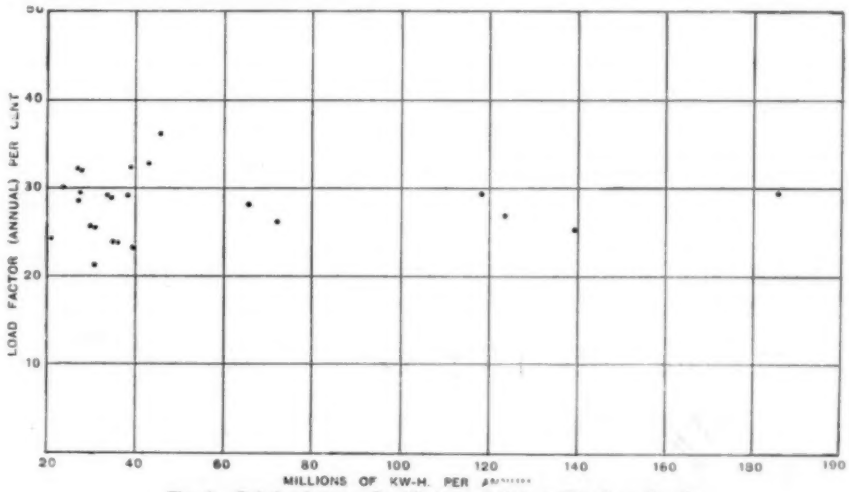


Fig. 4.—Relation between Load-factor and Output (Fig. 3 continued).

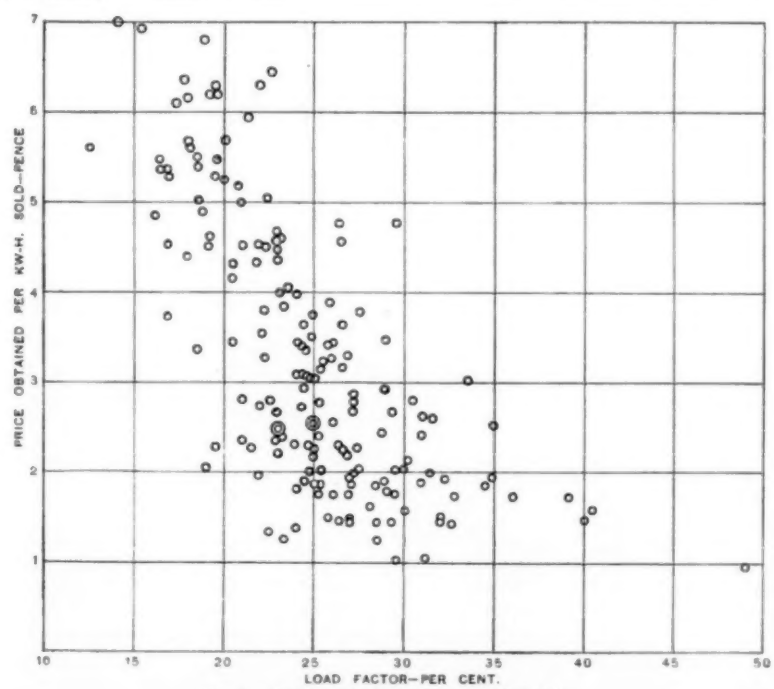


Fig. 5.—Relation of Load-factor to Selling Price.

minor economies in operation. As to the relation of load factor to selling price, as shown in figs. 5 and 6, although there is, as might be expected, great disparity in results, a gradual fall on expected lines does occur in selling price with increase in load factor. The limits of such an investigation must be acknowledged, for the price obtained is, of course, related to the market value, as well as to the cost of production. Yet something seems out of joint when at a 25 per cent. or 27½ per cent. load factor a difference in price of 350 per cent. occurs. This glaring discrepancy has no doubt been recognised and will, it is hoped, be provided against in the Government's new Electricity Bill when it becomes law. Undertakings having costs and prices of such "ignoble eminence" should no longer be allowed to scotch progress, and should be assisted, dutifully, to fade away.

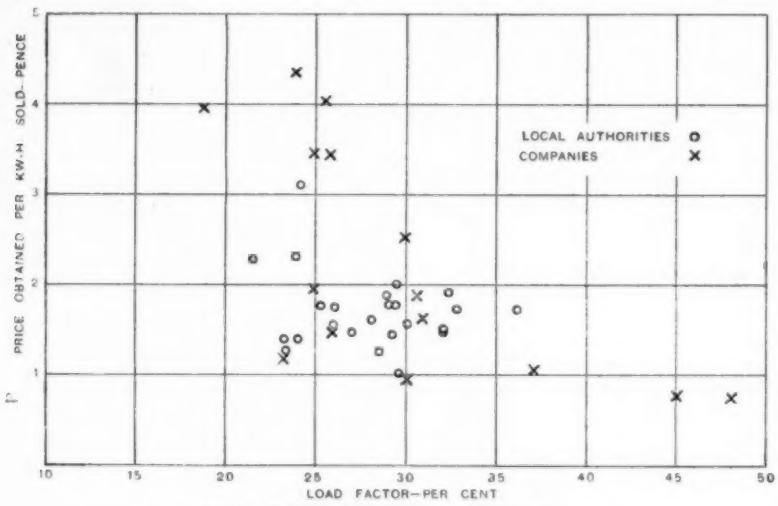


Fig. 6.—Relation of Load-Factor to Selling Price.

Fig. 5 relates to *all* local authorities in England having outputs from quite small figures to nearly 50 million units per annum. But in fig. 6 a comparison of price and load factor has been made between companies and local authorities having outputs ranging from 10 million to 186 million units per annum. The Newcastle-upon-Tyne Electric Supply Company, with its Associated Companies, is not shown; it is singular as having an output of 443 million units per annum. It has the highest load factor—48 per cent.—and the lowest price at .76d. per unit sold; but it will be remembered that it is operating in a particularly favourable field.

The comparison (fig. 6) is singularly interesting as showing how much more consistent are the results of local authorities than those of the companies. The companies do not show up very well, the greatest variation in price on approximately the same load factor being: companies 360 per cent., and the local authorities 220 per cent.

A contemplation of fig. 6 may, it is suggested, prove instructive and helpful to the companies in so far as it may indicate to them the advisability of making some sacrifice in the interests of their consumers. It is perhaps unwise in early and development stages to curtail profit, for the spirit of adventure must be encouraged; but it would seem that, not only in the present state of the public supply of electricity, but also in the greatly extended and far-reaching sphere in which it is intended it shall function in the near future, some sliding scale whereby profits are allocated so as to ensure some definite relationship between dividends on capital and reduction in price should be applied, and would result in nothing but good in the end.

The Insulating Properties of Fused Basalt.

BASALT is a rock of volcanic origin, and is plentiful in many parts of the world, notably in England, France, Germany, and America.

The approximate constitution of basalt is: Silica, 55 per cent.; alumina, 12 per cent.; iron oxide, 22 per cent.; and small quantities of lime, soda, potash, and magnesia.

In its natural state basalt is extremely difficult to work, owing to its great hardness. It can, however, be fused at a temperature of 2,300 deg. F., and can then be cast in moulds of any desired shape. At this stage it resembles black glass and is extremely brittle, but if it is then subjected to a lengthy thermic process it becomes annealed and is restored to its original state.

The dielectric strength of the annealed basalt is 35,000 volts per ¼-in. thickness; it possesses a tensile strength of 18¾ tons per square inch, and withstands a compression stress of 18¼ tons per square inch.

The coefficient of expansion with temperature of basalt is comparable with that of iron; consequently iron parts may be incorporated in the molten basalt before solidification, thus doing away with the need for cementing, with all its disadvantages. This is particularly important for certain forms of switchgear insulators. Metal parts can, if desired, be screwed direct in the basalt.

A further great advantage of basalt is that, should an over-pressure, such as might be caused by lightning, occur, and the arc pierce the insulator, the basalt re-solidifies immediately after the passing of the current, and the insulator will remain in service without damage.

Some interesting tests, which bring out this unique property of basalt, were made by the Laboratoire Central d'Electricité, of Paris, on April 13th, 1925 (Test No. 32,202). The tests were made on 10 anchorage insulators, the dimensions of which are shown in the accompanying sketch, fig. 1, with an alternating current having a frequency of 42 cycles.

The tests showed a first flashover at from 27,000 to 30,000 volts, whilst arcing commenced at from 32,000 to 37,000 volts. Each insulator was then immersed in oil and subjected to four consecutive piercing tests. The e.m.f. was gradually built up till puncture occurred. A second similar test was recommenced immediately after the first piercing, and likewise a third and fourth.

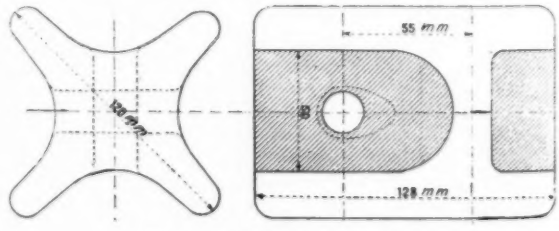


Fig. 1.—Basalt Anchorage Insulator.

The following is an average result:—

First piercing occurred at		32,000 volts.
Second	ditto	35,000 volts.
Third	ditto	33,000 volts.
Fourth	ditto	33,000 volts.

It will be noticed that it took a greater e.m.f. for the second puncture than the first. This phenomenon occurred in most cases, either between the first and second or the second and third tests.

The chief advantages claimed for fused basalt over existing materials are:—

(1) Its high dielectric strength.

(2) It has no hygroscopicity, none whatever.

(3) Its resealing properties when punctured.

(4) The possibility of incorporating stalks, hoods, or any other metal parts in the insulator.

(5) It resists all atmospheric changes, and even acids.

(6) It can be moulded to practically any shape.

(7) It is somewhat cheaper to produce than the porcelain now in common use.

(8) Comparing its strength with any known vitreous material, it possesses a very much greater tensile strength and will withstand a far higher compressive stress.

Fused basalt insulators are at present used extensively on the French electric railways, the P.L.M. alone having 75,000, and it is under test on several railways and tramways in this country.

Figs. 2, 3, and 4 illustrate some of the insulators which have been made from basalt.

Figs. 2, 3 and 4.—Types of Fused Basalt Insulators

The firm dealing with the manufacture of this new insulator in this country is Messrs. R. W. Blackwell and Co., Ltd., to whom we are indebted for the foregoing particulars.

CO_2 Records and their Interpretation.

By CHAS. F. WADE, A.M.I.Mech.E., A.M.I.E.E.

CAREFUL and continuous observation of the percentage of CO_2 in the waste gases from any boiler plant is indispensable if the efficiency is to be maintained at its best figure, but what is equally essential is that the records obtained shall represent as nearly as is practicable what is the true state of affairs and that such records shall be correctly interpreted. The mere blind following of the records obtained from an instrument connected either to the main flue of a battery of boilers or at the back of a single boiler, without special precautions having been taken to ensure that the percentage shown will give a correct indication of the true average CO_2 content will, almost certainly, lead to erroneous conclusions which may have quite a serious effect upon the efficiency of the plant.

When we begin to study the question carefully, it is found that the extraction for analysis of a really representative sample of the gases is not such a simple matter as may appear at first sight, and the larger and wider the boiler becomes, so much more difficult is the problem to be solved. First, let us consider the various influences which will be at work on the type of plant found in the majority of power stations to-day, which will consist of water-tube boilers fitted with mechanical stokers and burning various grades and sizes of coal. In the more recent installations pulverised fuel will be in use, but in this case it will be much easier to obtain true and representative samples of the gases than with solid fuel firing owing to the homogeneous nature of the mixture of fuel and air to begin with. In this article the writer will confine his remarks to the question of solid fuel only.

The first influence upon the CO_2 indication will be the size of the fuel, whether it be mixed or screened, and also how it is fed into the stoker hopper, followed by its distribution over the firegrate. Secondly, the CO_2 percentage will be influenced by the nature of the fuel in regard to its relative percentage of fixed carbon and volatile matter. Next, the width of the grates will exert a considerable influence upon the tendency to stratification of the gases, this last also depending for its extent upon whether the tubes are staggered or otherwise. Air leakages into the gas passages will vary in their effect upon the accuracy of the record obtained by their position, *i.e.*, whether near to the point of sampling or otherwise. Another point to be considered is what the record is required for; if needed for the accurate regulation of fuel and air supplies only, a point for sampling must be selected as near to the firegrate as possible and only far away enough from it to ensure that at the point selected combustion has been completed, but the gases have had the least opportunity of being diluted with air by leakage through the settings. When an indication of the general state of the boiler is desired, including the condition of the brickwork settings, the correct position for the testing point is at the final exit, while a comparison of readings at the two positions referred to will give a good idea as to the extent of any air leakage which may be taking place.

Dealing with the effect which the size of the fuel will have upon the CO_2 record, with the usual arrangement of coal-gate on chain-grate stokers in which the contour of the gate allows greater thickness of fuel at the sides of the grate, provided that the weight of fuel is distributed evenly across the hopper, the CO_2 content of the gases will not vary to any appreciable degree across the gas path, for the additional thickness of fuel at the sides will burn more rapidly than at the centre owing to the effect of the proximity of the incandescent side walls of the arches. If ordinary fixed coal chutes are in use, the result will be that the increased opening at the sides of the coal gate will be neutralised by the decreased weight of the fuel in the hoppers at the sides so that the fires will not only burn out more rapidly, due to the effect of the hot side walls, but also because of the greater air access to the fuel caused by less close packing than at the centre of the grate. There will consequently be a tendency towards greater excess of air at the sides of the furnace than at the centre, this being aggravated by the diversion of the air from the centre and thicker fire, where it is mostly needed, to the sides where the supply should be, if possible, restricted. It does not by any means follow that the excess of air passed through the sides of the fire will mingle with the partly-consumed combustibles from the centre, the probable result being that the stratification of air and gases set up in the fire will be more or less preserved throughout the complete path of the gases through the boiler.

When mixed coals are employed, the sorting-out of the nuts and slack in the hopper will greatly accentuate the stratifying effect described above, and the use of

this class of coal is to be avoided wherever possible. As the grates become wider, the greater will be the difference in gas analysis between the sides and centre and in the middle chamber of a water-tube boiler there may be a variation from 9 per cent. to 15 per cent. of CO_2 in the gases from sides to centre respectively. Of course, every effort should be made to ensure even combustion right across the grate, but even with the best of precautions the likelihood of more or less stratification must not be overlooked when deciding upon the method to be adopted in sampling the gases for analysis. In the case of boilers with staggered tubes stratification will most certainly be reduced, but complete mingling of the gases cannot be relied upon even in such cases and, if the gases and air do become thoroughly mixed by the time they reach the dampers, the final mixture will not have been attained until active combustion has entirely ceased. Under these circumstances it will readily be appreciated that with fires which are not burning evenly across their width, it is quite possible to have a comparatively low CO_2 record at the dampers while the gases actually have an appreciable percentage of CO, CH_4, and H_2 left in them and representing serious waste of heat value of the fuel. Such a state of affairs would exist when the sides of the gas passages give a CO_2 percentage of 5 per cent., and the centre a reading of, say, 15 per cent., the resulting test of the mixture showing 10 per cent. of CO_2.

Where such stratification exists, however carefully we arrange our sampling pipes, whether in the form of a spider in the flue or of a series of pipes of different length, the simple CO_2 recorder or indicator will not necessarily give us a true idea of the conditions of combustion, especially in connection with a large modern unit. Even the inclusion of a CO record does not furnish data for accurate calculation of losses, although this will afford an indication that things are not as they should be. The CO originating from the centre core of the gases will probably be the percentage generated from a considerably smaller amount of coal consumed per hour than that burned at the sides with a much larger percentage of excess air, so that the CO will apparently indicate a more serious shortage of air generally than is actually the case.

The existence of air leakages will be another factor helping to increase the difference of analysis between centre and sides if the inleakage takes place through the side walls, as is usually found.

Two methods are in use for the purpose of obtaining as nearly as possible a true average sample of the gases across their path. One of these methods is to employ a spider pipe with its centre situated halfway between the wall and centre line of the boiler. If the spider has six legs or branches, care must be taken that one diametric pair of branches is vertical, so that in each vertical line the gases will be tapped at two points. If the spider is so set that a pair of its legs are horizontal, the result will be that samples taken at the centre and extreme side of the gas passage will only be half the amount of those extracted from the intermediate positions, so that the sample passed to the recorder will not be a true average of the whole. The other method is to use several horizontal pipes with their open ends in the flue equally spaced across half the width of the boiler, while the other ends are brought into a common pipe leading to the recording instrument. Although the collection of a fair sample of the gases, from which the state of combustion and losses can be calculated accurately, is practically impossible, yet either of the two methods of sampling described will result in the collection of a sample which will be as nearly correct as can be hoped for.

From time to time one reads very definite statements by various writers asserting that either some particular percentage of CO_2 cannot be exceeded without CO becoming manifest or, on the other hand, that quite a high percentage can be obtained without any danger of the presence of CO. One has to realise that the name "coal" is not one indicative of a substance of definite composition and properties, but covers a very great range of combustibles from semi-anthracite to subbituminous coals at opposite extremes of the scale, and including an equally wide variation in burning characteristics. In view of this fact, it is easy to see that the writers referred to in all probability have quite accurately stated their own experience, but have carried out their respective investigations with quite different varieties of fuel. Any pronouncement on CO_2 limitations will be of little or no value to other fuel users unless a description and proximate analysis are furnished at the same time. As illustrative of the above facts, some very interesting investigations have been carried out on the Continent with a view to ascertaining what is defined as either the "critical point" or "critical range" of combustion for fuels with differing burning characteristics, or the point at which CO becomes present in sufficient percentage to constitute a serious source of loss. It was found that with coals which are difficult to ignite and burn, *i.e.*, those low in volatile content, a well-marked point was reached at which, although the CO_2 content was low (12 per cent. to 13 per cent.), CO became manifest and increased very rapidly with attempts to reduce air supply or to fire more heavily; with such coals the presence of the least percentage of CO indicates a point where any attempt to increase the CO_2 percentage will be accompanied by a greater loss due to partly unconsumed combustible than the saving effected by reduction of sensible heat loss in excess air. On the other hand, with coals easy of ignition and burning, this critical point is only reached with a much higher CO_2 percentage, and at the same

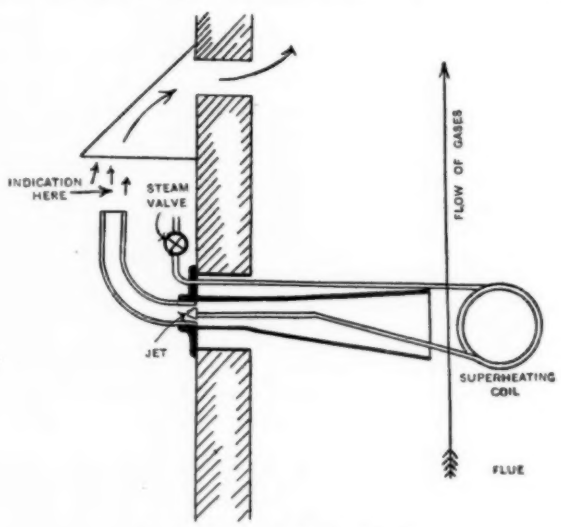


Fig. 1.—Carr's Combustion Indicator.

time the point is not at all definite. CO becomes manifest in small percentage, and increases so slowly with increase of CO_2 that the loss due to the unconsumed monoxide is balanced by the saving of heat due to reduced percentage of excess air; consequently there is no definite critical *point*, but there is a critical *range* instead. Once, however, the loss due to unconsumed combustible begins to outweigh the saving due to decreased excess air, the curve of percentage loss begins to rise rapidly. With the bituminous coals, which are those mainly used and which constitute the class having a more or less protracted critical range of combustion, it must be remembered that other effects which lead to loss may be introduced if working to a high percentage of CO_2 is adopted. The production of black smoke is the principal trouble which is likely to be experienced with the accompanying trouble of the heat insulating layer of true soot on various portions of the heating surface; this, unlike flue dust which lodges only on the upper surfaces of tubes, adheres to every portion of the surfaces with which it comes in contact. In the comparatively moderately-sized plants, where a battery of boilers is served by a common main flue and chimney, the localisation of the cause of black smoke is not always easy, and some sort of indicator is needed for picking out the offending boiler in a battery, the most simple

and effective device of this kind known to the writer being shown in the sketch. This appliance is known as Carr's combustion indicator, and consists of a small jet of superheated steam or compressed air which extracts a small sample of the gases from the middle chamber or other suitable point in the circuit, and discharges it either into the boiler ashpit, where it can readily be seen, or else by means of a suitable hood whence it came. When smoke is being produced, it is made instantly visible, the ideal conditions to work for being the least suspicion of visible smoke which indicates the nearest practical approach to perfect conditions of combustion in the particular furnace to which it is attached. Incidentally, this device does not appear to be nearly as well-known as it deserves, and it has given the most satisfactory results in the writer's hands, being easily comprehended by the most unintelligent of firemen.

From what has been said, it seems that in the case of large boiler units at least, two combustion records should be kept, the first being taken at the middle chamber and preferably including both CO_2 and CO charts for the observation and control of air and fuel regulation, while a plain CO_2 recorder installed at the point of gas exit will, by comparison with the first record, furnish evidence as to the physical state of the boiler settings with regard to air leakage and overall condition.

Bearing in mind the variation in critical point or range of combustion with various classes of coals, it is essential that the economical limit of maximum CO_2 percentage shall be carefully determined before setting any particular figure to be aimed at by the boiler-house staff, and this maximum will be somewhat variable if the coal used is not all of one class. In order to set about this, a close approximation to the carbon and hydrogen contents of the fuel used is necessary and is preferably obtained by regular ultimate analysis for these constituent elements, and this will provide the necessary data, together with the waste gas analyses and temperatures, to calculate accurately the percentage chimney loss under any conditions. It is also necessary that a boiler shall be put into as nearly perfect a condition as is possible with regard to cleanliness, baffling, and absence of air leakage, so that the limits it is desired to ascertain will be arrived at accurately when the particular coal under examination is used under the boiler. The actual calculations involved will not be described here, but once the ultimate analysis is known, a chart should be prepared showing the heat loss per pound of fuel under various conditions of CO_2 and temperature in the waste gases, and also a chart showing the additional loss for varying percentages of CO for the same coal. The test is made by gradually decreasing the amount of air admitted to the fires per pound of fuel burned and taking careful note of the CO_2, CO, and temperature of the waste gases, from which data subsequent calculation will determine the most economical CO_2 percentage and the highest permissible CO with minimum loss in the gases.

Since high percentage CO_2 is accompanied by high furnace temperatures, the permissible maximum will be largely influenced by the fusion temperature of the ash. With ash of a low fusing temperature, usually associated with the ferruginous ash of reddish or brown colour, high furnace temperature will cause ash fusion, which, in its turn, causes obstruction in the firegrate air spaces and results in incomplete combustion, while the light-coloured ashes are of much higher fusing point and permit of higher furnace temperature and more efficient conditions of combustion and radiant heat transmission. Incidentally, it is often a paying proposition to introduce steam jets beneath the firegrates when coal containing "low fusing" ash is obtainable at a price which makes the additional steam consumption worth while, as this will prevent the formation of masses of fluid clinker and enable full furnace temperature to be developed without risk of losses through incomplete combustion. The steam will also preserve the life of the firebars enormously, this being proved by the large number of patent steam-blown hand-fired grates which have not required firebar renewals for periods of years, although high-furnace temperature is one of the reasons for the economy in use of this class of furnace.

In conclusion, it may be as well to mention that CO_2 and CO records by themselves do not furnish all information as to losses which may be taking place, but only the degree of efficiency with which the fuel actually burned to the gases mentioned is used. Short circuiting of gases, excessive convection losses, blowing off, excessive blowing down, poor heat transmission due to dirty heating surfaces, combustible in the ash heap, &c., are all important sources of loss which the gas analysis tells us nothing about.

Concerning High-Tension Batteries for Radio Sets.

How to obtain Efficiency with Economy.

By PAUL D. TYERS.

PROBABLY one of the greatest deterrents to the universal popularity of broadcast reception is the frequent necessity of replacing the high-tension battery. The high-tension difficulty has been partly solved by the marketing of various devices for deriving the high-tension supply from public electric light mains. Most of these devices, however, usually provide only one or two voltages, and are, therefore, not so readily adapted as the ordinary type of high-tension battery. Moreover, the alternating-current models particularly are apt to be expensive, and, accordingly, a vast majority of listeners still employ the more normal high-tension battery.

Probably few users and retailers realise the importance of employing a high-tension battery suitable for the particular set with which it is to be used. The power valve, which has been developed and popularised during the last two or three years, necessitates a greater demand for current upon the high-tension battery, and it is a well-known fact that the smaller the rate of discharge the longer is the probable life of the high-tension battery. Batteries are now made in two or three capacities, the larger-sized cells probably having a life of two or three times that of the smaller sizes for any given discharge.

It is interesting to note that one well-known battery manufacturer is now indicating on the batteries the type of sets or valves for which they are really suitable, and the dealer would do well to point out this fact to his purchasers. The man with a seven- or eight-valve set, including perhaps two power amplifying valves, will receive little satisfaction from employing the ordinary small type of high-tension battery, although, no doubt, thousands are using them. If the dealer points out the benefits which will be derived from purchasing the larger type of cell he will do much to gain the confidence of his customer. Although it means that he will not have the opportunity of replacing the high-tension battery for a much longer period, he is not only

selling a much higher-priced article, but he is also giving more satisfaction, which is a point that should not be overlooked.

Nothing can be more deceptive than many of the cheap foreign high-tension batteries. It is not meant that foreign batteries as a whole are inefficient, but out of quite a large number tested by the writer they have been found to be inefficient when compared with our own productions. Although the cheaper types of battery may be more attractive from a selling point of view, their use appears to be false economy, since they do not last as long as the better class of battery, and several which the writer has tested have given trouble due to faulty cells developing.

Another factor very materially determining the life of a high-tension battery is that of insulation, and steps should be taken to guard against loss due to leakage. High-tension batteries should on no account be kept in damp places, while it is also important that they should not be exposed to too high a temperature. It is also a very wise policy to disconnect the high-tension battery from the receiver when not in use, as this not only eliminates the possibility of leakage in the set, or by wires connected to it, but also minimises the chances of the inter-valve transformers breaking down.

Efficiency in dry-battery high-tension supply can briefly be summarised as follows: Use a battery which is composed of cells sufficiently large to supply sufficient anode current without exceeding the useful discharge rate consistent with capacity. Use cells of good quality only. Maintain adequate insulation of the battery. Disconnect the battery when not in use.

The Electricity Policy of the French Government.

The Functions of the Electrical Committee.

By THEODORE RICH.

AT the present moment, after our Government has forced through the second reading of the Electricity Bill with the argument that this country is behind the rest of the world, it is worth while to study the laws and policy of some Governments in countries where the conditions are not too far removed from those obtaining in our own land.

France is one of those countries where the climatic and social conditions do not differ very materially from ours, but it appears that the gross consumption of electrical energy per head per year from public supply is sensibly greater than in this country. If one can judge by the French technical Press, by the published laws and regulations, and by opinions expressed by men of standing, then apart from factors which hardly exist in our country, such as millions of horse power which can be developed from water flow, France, at the present day, cannot to any material extent be said to owe her position to the adoption in the past of any drastic policy such as that recommended to us by our Government.

The system adopted has worked very well; it has undoubtedly produced results. It is not the product of any political "stunt" legislation, and successive governments of different political complexions have supported it and improved it from time to time. The public as a whole realises that while the cost of many commodities has gone up about five times since August, 1914, the cost of electricity has gone up very much less, and is, therefore, satisfied. There are certain features connected with the densely populated Paris area, and certain arrangements which follow naturally from the development of water power without reservoirs of capacity equivalent to many weeks' power supply, which have certain similarities to some proposals in "The Bill," but they are not to the same extent applicable to our conditions.

France is still mainly agricultural in character, and despite that obstacle she owes her electrical progress very largely to factors that our Bill makes no serious attempt to touch upon—namely, the comparatively simple and inexpensive procedure for the obtaining of concessions, and the facilities for distribution at low capital cost. If one can judge from interviews with men of prominence in France, the absurdity and unfairness of contrasting California, Sweden, or Shanghai with England as a whole seem to be perfectly manifest; and the extraordinary way in which evidence was selected for the Weir Report, which report has been closely examined in some quarters on the other side, is not likely to improve the reputation of the British Government or of the parties responsible for it.

Common-sense Laws and Regulations.

The present policy in France is to a large extent based on the law of 1906, which has been modified somewhat to suit the conditions obtaining since 1914. Under this law an Electrical Committee was formed to advise the Ministry of Public Works, and in certain circumstances other Ministries, regarding practically all fundamental matters relating to electricity supply; its composition was such that political party influences were minimised, and Ministers soon realised that in accepting the advice of the Committee, they were relieving themselves of responsibilities of a highly technical and often very complicated character, and that in doing so in accordance with the spirit of the law of 1906, they were protecting themselves to a material extent against trumped-up attacks in Parliament regarding their actions.

For many years past, not merely in the case of electricity, the French Government has had sufficient far-sightedness to realise that if someone comes forward with a project for the provision of public services, the benefit to the community resulting from such services is likely to be considerable. Therefore, in legislation and in concession conditions, instead of putting in drastic penalties and pin-pricking obstacles, facilities are given so that in suitable cases the undertaking can be declared a "Public Utility;" it can then enjoy certain privileges analogous in some directions to those enjoyed by the Government Public Works Department itself. It goes so far, when so recommended by the Electrical Committee, where two public utilities are concerned, even if one is the Government Postal Telephone Service and the other is a mere money-making power company, that even if the former has been first on the field, it must give way if the interest of the public makes it desirable to do so.

When considering the legislative and administrative situation in France regarding electricity supply matters, one must remember that admirable as the arrangements are in many respects, owing to the differences in the Constitution, differences in local government (for instance, the existence of prefectoral supervision), and the fact that nearly all the electricity supply in France is in the hands of private enterprise, it would be undesirable, if not impracticable, to adopt the French system in our country *en bloc*. There are, however, numerous points of practical value, and subject to modifications and safeguards there is much in the French system worthy of adoption.

The Electrical Committee.

The Electrical Committee forms a sort of Parliament, Advisory Board, and Court of Technical Appeal for electricity supply and power matters. There are thirty

members, half nominated by representatives of the Ministries of Public Works, Interior, Commerce, Industry, Posts and Telegraphs, War, and Agriculture. Fifteen members are drawn from various representative professional and business bodies concerned with electrical matters, being as a matter of form nominated by ministerial decree on the recommendation of the Ministries of Public Works, Commerce, Industry, Posts and Telegraphs. As a matter of fact, as the Government genuinely desires to be on friendly terms with, and to co-operate with, the leading bodies in the electrical industries, several such bodies are invited to send forward a list of members of the executive in order of recommendation, and the required number from each body is almost invariably selected from the top of the list.

The secretary and assistant secretaries are chosen from the engineering staff of the Ministry of Public Works, men who have had a high-class engineering training at the College of the "Ponts et Chaussées" with practical experience to follow. At present the president of the Committee is M. de la Brosse, Inspector-General of the "Ponts et Chaussées," with vice-president M. Legouez, who is president of the Union of Electrical Societies. Among the members are to be found an Inspector-General of Road Services; the Head of the Roads, Lighting, and Sanitary Services of the City of Paris; the chief engineer of the Midi Railway Co.; a representative of the Union of Electricity Distributors; the general manager of the Lyons Gas and Electricity Co.; a General-in-Command of the Transport Services of the Army; a Colonel-in-Charge of the Electrical Branch of the French sappers; and representatives of electrical manufacturers and various power and tramway undertakings.

The Committee gives its advice in numerous cases laid down by the law, and has to assist public departments when required; some of its functions are analogous to those of our Electricity Commissioners, but it has nothing like the same compulsory powers; for instance, it does not claim the right to veto the extension of plant in any steam station, neither has it any right whatever to meddle in the selection of plant for private installations. The members of the Committee as such are unpaid, its offices are unpretentious, and the cost of electricity control to the different supply authorities is relatively small. In France Government officials are usually expected to give their services to other departments without extra pay, and apparently membership of the Committee is looked upon as an honour like membership of the Councils of some of our leading institutions. The Electrical Committee does not proclaim that electricity supply in France is so badly conducted that the Government is forced to make a huge monopoly of it, and the policy of the members is to assist rather than to dictate.

In the twenty years of its existence, the Committee has functioned in a harmonious manner. Those who find that certain regulations and rules are acting harshly and are tending to clog progress can appeal to the Committee usually through the Ministry of Public Works without a lot of legal expenses. Details of accidents which take place have to be reported to it, and in suitable cases it recommends prosecutions for infractions of regulations.

Other Committees.

Although strictly speaking without statutory powers, so that the Ministries concerned are not compelled to consult them, certain other committees have been formed, among them one connected with the distribution of electrical energy made up of twelve representatives from different Ministries, twelve from various branches of the electrical industry and professions, and twelve from Chambers of Commerce and similar bodies. There are also two committees relating to water power, one dealing with its scientific study, and the other with matters relating to its utilisation.

The N.E.L.A. Convention at Atlantic City.

By PHEIDIPPIDES.

THE forty-ninth convention of the National Electric Light Association, held in Atlantic City, N.J., May 17th to 21st, proved to be a record gathering. Close on ten thousand delegates and friends attended from all parts of the United States to take part in the technical and commercial discussions of the numerous committees and to hear important speeches from men prominent in the electrical industry and political life of the United States. Even this immense gathering, however, was no very serious tax on Atlantic City, with its huge hotels and spacious piers. The headquarters for the meetings and social events was the main hall on the Million Dollar Pier, which accommodated the entire convention, whether as an auditorium during the day time or as a ball-room in the evening. The covered part of the pier also provided, in addition, a space of a hundred thousand square feet into which upwards of three hundred exhibitors had collected a remarkable display of electrical apparatus and machinery.

The guests were received on the evening of May 17th by the President of the Association and Mrs. Davidson. After the reception there followed a concert by the famous Vincent Lopez Orchestra from New York, and dancing continued to a late hour.

On the Tuesday morning the first general session was held under the chairmanship of President J. E. Davidson; the principal speakers were Mr. M. S. Sloan, of the Brooklyn Edison Company, and Mr. Owen D. Young, chairman of the Board of the General Electric Co. and Radio Corporation. It will be recalled that Mr. Young co-operated with Vice-President Charles P. Dawes in the drafting of the Dawes plan for the settlement of war reparations. In his speech, Mr. Young made an earnest plea for the private ownership of public utilities. He said that a quarter of a century of close observation of Government operation of utilities had convinced him that its efficiency was markedly less than that of the private companies. "I have seen too many instances," Mr. Young said, "where no one but the Government would have dared to give such inadequate and inefficient service." He showed how political influences interfered with the progress of electrical development, and called for support in the full adaptation of new inventions and new engineering, not only in the physical plants, but also in the social sciences, in order to attain the goal of maximum public service.

Public ownership and public relations were the chief points under discussion at this session, and the President's address was a stirring call to arms, that the industry might continue work of the character which had given it its present happy position. Though the light and power industry had lowered costs, increased standards of service, and established an enviable credit standing, it was still necessary to carry out the responsibilities of utilities in order to give good service.

In a vigorous and telling address, Mr. M. S. Sloan directed attention to public relations. Public opinion, he said, was now favourable to the industry, and this was due to the efficient work which had been done by the Association on this subject. He pleaded, however, for continued executive support, as the problem was not completely solved, and co-operation between public utility information bureaus was as necessary now as ever it was. Other speakers were Messrs. R. H. Ballard,

Southern Californian Edison Co., and W. C. L. Eglin, Philadelphia Electric Co.

On the third day of the Convention the Honourable Andrew Mellon, Secretary, U.S. Treasury, delivered a broadcast address, in which he showed that mass production, inventive genius, elimination of class hatred, and recognition by capital and labour that only a prosperous industry could pay high wages, were among the principal factors which had contributed to the high level of industrial development and the prosperity obtaining among all classes in the United States. "It is," said he, "organised industry that has brought about the present unprecedented development in this country. America has adjusted herself to the economic laws of the new industrial era, and has evolved an industrial organisation which can maintain itself, not only because it is efficient, but because it is bringing about a greater diffusion of prosperity among all classes."

The Honourable James John Davis, Secretary, U.S. Department of Labour, made a stirring appeal to the Convention to promote better lighting and more cheerful surroundings in factories so that workmen might be saved from accidents, goods saved from spoiling, and production increased. When science discovered that, by means of electricity, it was able to flood our homes and shops and streets with a light as brilliant as that of the sun, creation widened to man's view. "No wonder," said Mr. Davis, "that Diogenes failed in his quest for an honest man—his lantern was much too dim. Light has a strong tendency to make men honest, and the flooding of our streets and shops with electric light does more to discourage the burglar than all the police in the world."

Mr. G. E. Creed, chairman of the Water-Power Development Committee, said that twenty-three new hydro-electric plants put into operation during 1925 had increased the hydro-electric service of the United States by 2,352,537 kilowatt-hours, bringing the total up to 22,322,000,000 kilowatt-hours. Steam plants, he said, increased that to over 65,800 million kilowatt-hours, an increase of 11.5 per cent. in one year.

On the 19th, Mr. Thomas A. Edison visited the Convention, and during the day inspected the various exhibits. At the dinner in the evening one speaker remarked that the electrical industry was still interesting to the man who started it, and the remark evoked such continued applause that Edison, who has consistently refused to broadcast, was compelled to say a few words into the microphone. At the evening session the Charles A. Coffin Medal was awarded to Mr. Samuel Insull, president of the Commonwealth Edison Co., of Chicago, and other prizes ranging in value up to $2,500, for accomplishments resulting in higher standards of lighting, were awarded to various organisations.

Mr. Guy E. Tripp, chairman of the Westinghouse Electrical & Manufacturing Co., addressing a general session of the Convention on the 20th, dealt specifically with industrial electrification and the value of electricity to the farmer, who in America at the present time is having a struggle against the costs of commodities. He asserted that only by decentralisation of American industries, combined with an increased application of electric power, could the farmer be lifted to a plane of profitable existence. He found occasion for considerable optimism in the fact that such decentralisation was proceeding on an increased scale. The chief obstacle to the electrification of farms, Mr. Tripp said, was the high cost of bringing electric service to them. It usually did not pay to take care of the relatively small demand of a few scattered farms, but it frequently did pay to do these things to serve an industry; and, when once a service connection was made and a line was built, neighbouring farms could be supplied with electric power at reasonable cost. Hence, as rural industries developed, more and more farms would be electrified.

On Friday, May 21st, the closing day of the Convention, the principal speaker was Mr. William L. Green, president of the American Federation of Labour at Washington. He pointed out that production due largely to the application of electricity had increased by between 25 and 50 per cent. during the past twenty-five years. "Electrically driven machinery has lightened the burden of employment," he said, "and relieved the workers of the drudgery and hardship of human toil. Life has been made more tolerable, living conditions improved, and the workers have been permitted to enjoy the blessings and benefits of modern life."

Election of officers for the ensuing year brought the Convention to a close, but special mention should be made of the high order of excellence of the gigantic electrical exhibition held in conjunction with the Convention. We have already indicated the size of the exhibition, which was one of the greatest displays of electrical devices ever organised. It was a third larger than the one arranged by the N.E.L.A. two years ago, and would have contained still another 100 exhibits if space had permitted. The British public is perhaps inclined to look a little askance at electrical domestic appliances, but the large number of electrical washing machines and refrigerators shown at Atlantic City—there were over a dozen different makes of the latter on view—show that such conditions do not hold in the United States.

A curious new device shown in the development stage was a machine for "seeing" smoke, which can be utilised to give warning of fire, and to control lighthouses during foggy weather.

A good many "organisation" exhibits were packed with valuable suggestions for the electrical education of the public. The National Electric Light Association itself, for example, had one illustrating the advance of super-power development, and another showing the evils of defective lighting in the home. At numerous points in the exhibition moving pictures were employed to show how the device worked, and one exhibitor had actually a talking picture which created considerable interest in the operation of a particular domestic refrigerator. We noticed that the salesman in the case was as bright and interesting at the end of the exhibition, after having told his tale perfectly some hundreds of times, as he was on the opening day. This cannot always be said of the exhibition salesman.

Another centre of attraction throughout the exhibition was a life-size wax figure of Venus, which visitors were invited to paint with light through the operation of a score of switches controlling a large number of colour combinations. A prize was given for the attempt most nearly in agreement with the opinion of a committee of lighting experts.

Throughout the period of the Convention a six-page newspaper was furnished gratuitously to all delegates by the *Electrical World*, with lists of members, and daily programmes of business and social functions, and interspersed with incidental and humorous Convention news.

In every possible way the Convention this year was an outstanding success. After 24 hours of storm encountered by the early arrivals, the weather was delightful; the exhibition was of outstanding interest, the social functions were well organised and fully enjoyed, and above all the business sessions were well attended and appreciated by the great majority of the ten thousand delegates. The officials and voluntary workers of the National Electric Light Association are to be congratulated on achieving a masterpiece of organisation.

Maintaining the Supply at Manchester.—The Manchester Electricity Supply Department reports that during the general strike the whole of the men employed by the Department remained at work, with the exception of nine bricklayers employed in the Building Section. Electricity supplies to the Department's consumers were maintained continuously without interruption. The failure to run a tramway service was not in any way attributable to the Electricity Department. The current was kept on the overhead lines continuously throughout the night of May 3rd and all day on May 4th, until a communication was received from the Tramways Department announcing that there was no immediate prospect of resuming the service. The lines were then made "dead," but everything was kept in readiness for resuming the supply at the request of the tramway authorities. The Electricity Committee, at a meeting on May 19th, adopted the following resolution:—"That this Committee desires to place on record its recognition of loyalty to the public service of its employés during the period of the general strike."

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Our Trade Names Supplement.—Along with the issue of the ELECTRICAL REVIEW for June 25th we shall publish the first of a series of four Quarterly Supplements of Electrical Trade Names. These will contain the names and addresses of manufacturers and suppliers of a large number of electrical products and materials which bear special Trade Names. Each Supplement will be distributed free to every one of our 13,000 readers at Home and abroad, and will enable them to get into direct touch with the maker of any article included in the List.

Proposed Amendments to Company Law.—The Committee appointed by the Board of Trade in January last year to consider and report what alterations were desirable in the Companies Acts has made a number of recommendations. Among these are proposals that the "hawking" of shares from house to house should be prohibited, and that certain particulars should be compulsorily furnished by those who offer shares by means of circulars. It is also suggested that the amount of discount upon new share issues should be limited to 10 per cent. of the market value of similar existing shares; and that undischarged bankrupts should only become directors of companies by permission of the Court. Other matters with which the report deals are the remission of stamp duty in the reconstruction of a company involving the transfer of property to a new company; the keeping of proper accounts; companies outside Great Britain; and the issue of redeemable preference shares.

Local Exhibition.—WEST HAM.—The chief engineer and manager of the municipal electricity undertaking (Mr. F. W. Purse) informs us that an electrical exhibition is being held at the Town Hall during the whole of next week.

New Private Businesses.—The following new businesses have recently been registered under the Business Names Act:—

Paddington Electrical Supplies, electrical and radio engineers, 327, Edgware Road, W.2.

Eastern Wireless Battery Supply, radio goods, 147, Roman Road, Bow, E.3.

C. D. Appleton & Co., electrical factors, 11, Marsden Square, Manchester.

West of England Radio, radio dealers, 99, Newport Road, Barnstaple.

Phœnix Electrical Co., electrical and radio supplies, contracting and heating, Picturedrome Buildings, Water Street, Radcliffe, Manchester.

F. Westbrook & Co., electrical and radio engineers, 14, Cross Street, St. Leonards-on-Sea.

The British Electrode Co., welders and manufacturers of welding electrodes, Deptford Park, S.E.8.

New Metro-Vick Signal Company.—The Metropolitan-Vickers Electrical Co., Ltd., has recently entered into arrangements for the sole manufacturing rights, for Great Britain and the Dominions, of the General Railway and Signal Company, of Rochester, U.S.A., and accordingly a new company, under the title of Metropolitan-Vickers-G.R.S., Ltd., has been registered. The new company is preparing to manufacture at the Metropolitan-Vickers works at Trafford Park all types of railway signalling apparatus, including the all-electric interlocking system, embodying the use of the well-known "dynamic indication" principle, of which, it is claimed, the General Railway Signal Company was the pioneer, its experience in the art of signalling having extended over thirty years. The company will also specialise in automatic train control of the intermittent inductive auto-manual type and the continuous inductive type; the absolute permissive block system for signalling on single lines; low-voltage point-operating machines for remote locations; car retarders for gravity marshalling yards, and many other systems and appliances.—*Modern Transport.*

Cheap Power in New Zealand.—A company formed for the manufacture of special steels is starting operations, says a message from Christchurch, New Zealand. The Dunedin municipal authorities are supplying electric power at one-third of the price paid in Sheffield. The company will manufacture all those parts of machinery which formerly were forged and now are cast by a new process. It will probably supply most of the requirements of the New Zealand railways and other big businesses, to the exclusion of British manufacturers.—*Financial Times.*

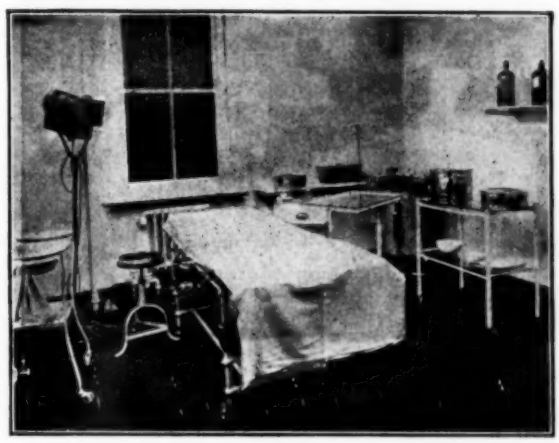
United States Import Prohibition.—According to the *Board of Trade Journal*, the United States authorities have prohibited the importation of synthetic phenolic resin of Form C and articles made of this, wholly or partly, on the ground that certain articles made of synthetic phenolic resin have been imported and sold in infringement of the Bakelite Corporation's patent rights.

British Radio Exhibit in Jugo-Slavia.—*Commerce Reports*, dealing with the Zagreb (Jugo-Slavia) Spring Fair, says that for the first time there was a complete radio exhibit and great interest was shown in this section in view of the projected erection of a broadcasting station in the district. The best display was from England; others, in order of their importance, were from France, Switzerland, Italy, Austria and Germany.

French Customs Decisions.—The *Board of Trade Journal* reports that the French Customs authorities have decided that electro-medical lamps for producing ultra-violet rays are to be classed as electro-technical apparatus (No. 524 *bis*). Incandescent lamps or mercury-vapour lamps, not mounted, are dutiable separately as such. Electric transformers are also dutiable separately. Loud-speakers ("Selectron" and the like) for gramophones and wireless are classed under "Accessories and detached parts of gramophones" (No. 604).

Electrical Development in the United States.—Some up-to-date statistics relating to electricity supply in the United States were given by Mr. J. E. Davidson, president of the National Electric Light Association, at that body's recent annual convention. He said that at December 31st, 1925, there were 13,460,000 wired homes, 2,750,000 commercial customers, and 675,000 industrial consumers. The total investment in the electricity supply industry was $7,350,000,000, and the gross income for 1925 was $1,425,000,000. The total number of customer-owners was 1,322,367, and they held 9,775,572 shares. The amount of energy generated during 1925 was 60,250,000,000 kWh. The population of the United States was given as 116,000,000, and Mr. Davidson stated that electric motors throughout the country were doing every day as much work as could be accomplished by 170,000,000 men. Electrical service cost less to-day than it did at the beginning of the war. The number of domestic consumers of the electric light and power companies had doubled in the last six years, but there were still more than 10,000,000 homes waiting for electrical service.

Operating Theatre Lighting.—The operating theatre of the Rugby Infirmary has recently been equipped with a "B.T.-H." lighting installation. The operating table is lighted by means of six "Glassteel" diffusers, each of which contains a 300-W "Mazda" daylight gasfilled lamp. The units are arranged in such a manner as to concentrate their



The Rugby Infirmary Operating Theatre.

light upon the table, which is illuminated to an intensity of about 80 foot-candles. The excellent effect can be gauged from the accompanying reproduction of a photograph taken at night solely by the light of the diffusers. The "Glassteel" unit consists of a "Mazdalux" reflector fitted with a glass diffuser which completely conceals the lamp and eliminates glare and deep shadows, producing the conditions which are essential in such an application as an operating theatre.

Brazilian Railway Electrification.—The May *Monthly Review* of the Bank of London and South America reports that the Government of the State of Sao Paulo (Brazil) has appointed Mr. A. C. Cardoso, a Brazilian engineer, to study the most up-to-date railway electrification schemes in the United States and Europe. Upon his return Mr. Cardoso will be in charge of the electrification of the lines of the Sorocabana Railway. His report, together with specifications, &c., will be delivered not later than August next to enable the railway to call for tenders forthwith for the execution of the electrification works. In order to assist firms who may be interested in the scheme, several publications have been issued giving full technical data and the broad lines on which the works will be carried out. Copies of these have been sent to leading electrical concerns and institutions in Great Britain, Germany, the United States, Switzerland, and Sweden, including the British Engineers' Association. The electrification of the Paulista Railway continues rapidly. It is intended to inaugurate a further extension of electric line from the Tatú station to Rio Claro before the end of 1926. The Rio Claro-Ityrapina section will then be taken in hand.

D

Municipal Trading at Sydney.—The Sydney (N.S.W.) City Council has been informed by its legal advisers that it is within its powers to proceed with the proposed scheme for the sale of electrical appliances and the wiring of premises. It has accordingly reaffirmed its decision to carry the scheme through. Alderman Mostyn (vice-chairman of the Electricity Supply Committee) said that it was the intention of the Council to break the monopoly which enabled firms to charge 35s. for electric irons which were imported at a cost of 12s. and to prevent other apparatus being sold at similar profits. The Council is to set aside £10,000 for the purpose during the current year and it is stated that every opportunity will be given to manufacturers to send goods on consignment to the demonstration rooms. In the meantime the Electrical Employers' Association continues to attack the scheme. It is stated that the venture will result in a loss and will adversely affect the electrical traders who have done much to increase the use of the electricity supplied by the City Council. It is suggested that the whole matter should be referred to Mr. Forbes Mackay, the city electrical engineer.

Spanish Railway Electrification.—It is stated that the Bilbao-Santander Railway Company is about to convert its line between Bilbao, Las Arenas and Algorta to electric traction and that the order for the electrical equipment, including the transformer station, has been given to the A.E.G., Berlin.

Siemens-Xcel Cooking Demonstrations. — To demonstrate the efficiency and economy of "Xcel" cooking equipment, the Siemens & English Electric Lamp Co., Ltd., has arranged a model kitchen at its Upper Thames Street premises, where contractors or their clients may see actual cooking carried out. The kitchen is a well-lighted, airy apartment, and the "Xcel" equipment consists of two cookers. One is type H. 1040, consisting of an oven and a hob-plate mounted on legs of a convenient height. Above the oven is a hot cupboard and beneath it is a shelf for utensils. The oven has six 350-W elements fitted in the sides, while the hob-plate contains two boiling plates (1,800 and 1,500 W) and a grill (1,500 W). The various parts are assembled to facilitate cleaning or replacements. The elements are all of the plug-in type, and all connections and fuses are enclosed, thus eliminating any risk of harm to the user. The other cooker is of type H. 1010, and consists of the oven described in connection with the H. 1040 equipment on shorter legs and bearing a hob-plate with two boiling plates and grills.

The "Siemens-Xcel" Kitchen.

An electricity meter is fitted in a prominent position near the cookers to enable visitors to see for themselves how much energy is consumed in cooking a meal. An efficient lady demonstrator is in charge of the kitchen. A view of the room appears in the accompanying illustration. Demonstrations are arranged as required, and intending visitors should notify the company before going.

Trade Announcements.—MESSRS. E. PINCOTT & Co. have removed from Market Street to 91, Queen Street, Exeter, where they wish to receive electrical catalogues, &c.

MESSRS. ARCHIBALD J. WRIGHT, LTD., have removed from City Road to 131, Bunhill Row, London, E.C.1. Telephone No.: "Clerkenwell 4439."

An electrical branch at 19-23, Park Street, has been opened in connection with the business of STEDDY & THOMPSON, LTD., 82, High Street, Ashford, Kent.

MESSRS. CHARLESWORTH, PEEBLES & Co. have removed their Glasgow office to larger premises at 276, St. Vincent Street, where they have their own warehouse. Telephone number unaltered: "Central 3537." The firm's head office is now situate at 5, Eden Street, Hampstead Road, N.W.1.

The Manchester branch of MESSRS. C. A. VANDERVELL & Co., LTD. (Bridge Street) has been transferred to that of Joseph Lucas, Ltd., 277, Deansgate, Manchester, where stocks of all radio apparatus are held.

Copper, Lead and Rubber Prices.—Messrs. F. Smith and Co. and Messrs. James & Shakespeare report, June 8th: No change in copper and lead prices.

Messrs. Edward Till & Co. report, June 8th: India-rubber, Para fine, 1s. 8d., ¼d. dec.

Catalogues and Lists.—HIGGS MOTORS, Witton, Birmingham.—June stock list of a.c. and d.c. motors, with full details and prices.

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38 and 39, Upper Thames Street, E.C.4.—Catalogue No. 96, containing illustrated details and prices of cookers, fires, irons, washing machines, and other "Siemens-Xcel" domestic electrical appliances. Also the company's monthly general price-sheet for June.

MESSRS. JOSEPH KAYE & SONS, LTD., 93, High Holborn, W.C.1.—An illustrated price list of oil cans, funnels, pumps, &c.

ST. HELENS CABLE & RUBBER CO., LTD., Slough.—An illustrated pamphlet dealing with the company's "U-Seal" system of corrosion-proof fittings for "C.T.S." in positions exposed to corrosive conditions.

THE SUN ELECTRICAL CO., LTD., 118-120, Charing Cross Road, W.C.2.—A catalogue of electric fans. Illustrated and priced.

FRANCIS LAMP LOCKS, LTD., 83, Pall Mall, S.W.1.—A folder describing the company's lock for preventing the theft of electric lamps.

MESSRS. FALK, STADELMANN & Co., LTD., 83-93, Farringdon Road, E.C.1.—An illustrated price list of "Antarctic" electric fans.

THE JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1.—June blotter advertising the company's open protected hotplate.

MESSRS. HERBERT MORRIS, LTD., Loughborough.—Book 109, containing illustrations and details of electric cranes and lifts.

MESSRS. FERRANTI, LTD., Hollinwood, Lancs.—Pamphlet Ta. 159/2, describing a 300,000-V testing installation in a porcelain factory. Also a leaflet dealing with the company's radio transformers.

MESSRS. WOOTTON & Co., LTD., High Street, Ponders End, Middlesex.—A card announcing reduced prices of plywood meter boards and backboards.

DELCO-REMY & HYATT, LTD., 111, Grosvenor Road, S.W.1.—A list of the company's official service agents in various districts.

THE CAMBRIDGE INSTRUMENT CO., LTD., 45, Grosvenor Place, S.W.1.—List No. 909, illustrating and describing the "Cambridge" versatile galvanometer for numerous a.c. and d.c. measurements.

MESSRS. JOHN MOORES & Co., Ravald Street Works, Salford.—A price list of insulating fabrics, ebonite, mica, micanite, fibre, &c.

THE ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, W.C.2.—A descriptive pamphlet (No. 1024) containing illustrations and details of the company's induction motors.

Private Arrangements.—M. JAMIESON, Richmond, Surrey, radio and electrical dealer.—A meeting of creditors was held on June 3rd at Anderton's Hotel, E.C., when the chair was occupied by Mr. P. Houston (Messrs. Sydney Revill & Co.), who reported that about 10 months ago the debtor took over a business at The Arcade, Richmond. He started on a borrowed capital of £500, which was paid over to the outgoing owner of the business. The £500 was borrowed from his father-in-law and the latter was an unsecured creditor for that amount. According to the approximate statement of affairs the liabilities totalled £948 and the assets £810. In reply to a question, it was stated that there was no offer at present; the debtor, however, was desirous of carrying on the business. It was decided that the debtor should execute a deed of assignment in favour of Mr. W. A. J. Osborne, of Messrs. Corfield and Cripwell, Balfour House, Finsbury Pavement, E.C., as trustee, together with a committee of inspection consisting of the representatives of the Sloan Electric Co., the Westminster Electric Co., and Mr. E. H. Hawkins, representing creditors. The following are creditors:—

	£		£
Sloan Electric Co.	34	Fada Radio	28
Cahill, P.	32	Westminster Electric Co. ...	32
Princes Electric Co.	24	Watson, H.	22
Turpitz & Co.	24	Solicitors	20

Bankruptcy Proceedings.—ERNEST ARTHUR PYE, motor and electrical factor, 4, Oxford Mews, Edgware Road, W.—The first meeting of creditors was held on June 2nd at the London Bankruptcy Court, a receiving order having been made on May 6th upon a creditor's petition. No statement of affairs was lodged, but the debtor roughly estimated his liabilities at £1,500 against book debts of the value of £20. The debtor stated that in March, 1921, he and a partner took premises in Paddington and started business as motor and electrical factors under the style of Pryce & Co. In November, 1922, they converted their business into Pryce & Co., Ltd., with a nominal capital of £2,000. Each partner received £500 in shares and debentures for £750 were issued. The trading was not successful and in March, 1923, the debenture holder appointed a receiver and manager, who has dealt with the assets, no return being made to the shareholders. The debtor recommenced business alone in September, 1923, as an electrical factor, and was later joined by a partner. He attributed his position to the failure of his last partner to provide capital as promised, or to repay £637 which, he alleged, that partner owed him. The estate was left in the hands of the Official Receiver, to be wound up in bankruptcy.

C. H. PATRICK, 132, Much Park Street, Coventry, electrical contractor and wireless dealer.—The receiving order in this matter was made on May 14th on debtor's own petition. The statement of affairs shows liabilities of £1,315 and net assets of £299, leaving a deficiency of £1,016. Debtor attributes his failure to domestic expenses, costs of legal proceedings, depreciation in value of wireless accessories, and fall in trade in that class of goods. He commenced business without capital at his present address in 1920. He was unsuccessful, and in October, 1922, an arrangement was made with his creditors for payment of a composition of 10s. in the £, for which purpose an advance of nearly £300 was made by a relative, this amount still being outstanding at the time of the proceedings. The relative in question also provided £100 to discharge debtor's overdraft under a guarantee, and this remained unpaid. In consideration of this advance, however, debtor gave a bill of sale over his household furniture. Debtor states that he has been aware of his position since the middle of 1922. The following are creditors:—

	£		£
Accumulators of Woking, Ltd. ...	21	Jones, W. H.	375
Coventry Electrical Accessories, Ltd.	33	London Electric Wire Co. ...	34
Cable Accessories Co., Ltd. ...	33	Philips Lamps, Ltd.	31
Electro-Mechanical Supplies Co.	76	Stringer, J.	26
Hands, A. C.	65	Westlake, T. E.	30
		Jones, W. J.	40

J. MACFADDEN, 177, Higher Hillgate, Stockport, electrician.—The public examination of this debtor was held recently at the Court House, Stockport. The statement of affairs showed ranking liabilities of £243, and there was a deficiency of £234. Debtor attributed his failure to lack of capital and keen competition. In 1924 he took a lock-up shop and commenced business as an electrician with £50 borrowed capital, but he was unsuccessful. The examination was closed

M. BREINGAN, electrical manufacturers' agent, 57, Robertson Street, Glasgow.—A dividend is payable on June 29th at the offices of Mr. E. H. Stanley Craig, 128, Hope Street, Glasgow.

J. N. DAVENPORT (separate estate), electrical engineer and contractor, 39, Hill Top Avenue, Cheadle, Hulme (lately carrying on business with L. A. Hackett as Davenport, Hackett and Co. at 36, Spring Gardens, Manchester).—First and final dividend of 20s. in the £ payable at 21, Spring Gardens, Manchester.

Company Liquidations.—B.M.A.S., LTD., Ashburton Road, Old Trafford, Manchester, manufacturers of electrical ignition apparatus, &c.—The winding up order in this matter was made on a creditor's petition. The statement of affairs shows liabilities of £25,012, while the assets are estimated at £10,828, from which a sum of £1,229 has to be deducted in respect of preferential claims, leaving an amount of £9,599, which is insufficient by £14,803 to meet the loans on debentures of £24,401. The issued share capital of the company amounts to £22,200, so that there is a deficiency as regards the shareholders of £47,212. The failure of the company is attributed to the falling-off in the demand for accessories. The title of the company is derived from "Battery Magneto Accessory Services," and it was incorporated as a private concern in January, 1925, with head office and works at Trafford Park and depôts for sales and repairs at eleven other addresses. The company was formed to continue the business previously carried on by the Runbaken Magneto Co., Ltd. It appears not to have derived any working cash capital from its issue of shares, and any such capital was obtained from book debts taken over and a bank overdraft of £24,401. On January 29th, 1926, the bank appointed a receiver, who took possession of the assets. He has closed all the depôts, but is carrying on the head office and works at Trafford Park with a small staff. A full set of books has been kept. The company was first sued for debt in January, 1925, and in all the company has been sued by 33 creditors; 16 of these creditors with claims amounting to £619 have been paid, and 17 claims totalling £920 remain unpaid. The failure of the company appears to have been contributed to by the lack of working capital, and by the heavy charges for wages, salaries, commissions, and travelling expenses. The Official Receiver is of opinion that further inquiry is desirable into the formation of the company and the conduct of its business.

FOSTER CONSTRUCTION CO., LTD., electrical, &c., engineers, 60, High Street, Plaistow, E.—The report of Mr. E. T. A. Phillips, Official Receiver and Liquidator of this company, has been issued. The winding up order was made last January and accounts have been lodged showing total liabilities of £16,843 (unsecured £4,896), assets of £1,153, after allowing for the payment of preferential claims (£630), and debenture bonds (£2,316), and a total deficiency of £21,189 with regard to contributories. The company was formed as a private company in December, 1914, with a nominal capital of £5,000, subsequently increased to £40,000, of which £17,697 has been issued. The object was to acquire from Walter and Arthur Foster (trading as W. Foster & Son), a business carried on by them, the consideration being agreed at £4,555 in cash and shares. The failure is attributed to insufficient capital, lack of up-to-date machinery; to taking contracts which the company could not profitably handle, and other causes.

MIDDLETON ELECTRIC TRACTION CO., LTD.—A meeting of members is called for July 12th, at the Electrical Federation Offices, 88, Kingsway, W.C., to hear an account of the winding up from the Liquidators, Messrs. T. Bower and T. H. Underhill.

REFLEX RADIO CO., LTD.—First meeting of creditors and contributories, June 14th, at Carey Street, W.C.

CAR LIGHTING & IGNITION CO., LTD.—A meeting of creditors was held yesterday, June 10th, at the offices of Messrs. Bradford & Gale, 584, Christchurch Road, Boscombe. (This meeting was purely formal. All creditors have been or will be paid in full.)

JOSEPH OXLEY (SHEFFIELD), LTD.—Voluntary liquidation resolution passed May 28th. Meeting of creditors, June 14th, at 46, Bank Street, Sheffield. Liquidator, Mr. C. L. Widlake, 9, Paradise Square, Sheffield.

Dissolutions of Partnership.—TAYLOR & ODDY, electrical engineers and metal workers, Kiln Hill, Slaithwaite, Yorks.—Mr. F. Oddy and Mr. F. Ramsden have dissolved partnership. Mr. Taylor will continue on his own account as electrical engineer at Belmont Works, Slaithwaite, and Mr. Oddy as sheet metal worker at Kiln Hill.

ANKH INSULATOR CO., manufacturers of mouldings for electrical work, Merritt Mews, Merritt Road, and Courtney Works, Kneller Road, Brockley, S.E.—The partnership between Messrs. H. C. Bryson, B. Purdy, A. Purdy, and J. Purdy has been dissolved by order of the High Court. Debts will be attended to by Mr. S. W. Revill, Cromwell House, Fulwood Place, High Holborn, W.C., the Receiver appointed by the High Court on April 13th, 1926.

A. G. WALL & CO., wireless dealers, motor-cycle agents, &c., Brighton Road, Purley.—Mr. A. G. Wall and Mr. W. J. Boxall have dissolved partnership Mr. Boxall will attend to debts and continue the business.

R. WRIGHT & CO., electrical engineers, Tyson Street, Cheetham Hill, Manchester.—Mr. R. J. Wright and Mr. J. E. Connell have dissolved partnership. Debts will be attended to by Mr. Wright, who will continue the business under the same style.

Belgian Engineering Wages.—It is reported that an increase of 5 per cent. in their wages has been granted to employés in the Belgian engineering industry by a commission appointed to deal with the matter.

Swiss Electrical Exports.—The past year witnessed a further development in the foreign trade of electrical engineering concerns in Switzerland, the exports during 1925 having attained a value of approximately £2,355,600, as compared with £2,160,600 in 1924. Details of last year's exports are given below:—

	£
Dynamos and machinery	1,123,080
Electrical apparatus and instruments	897,440
Copper cables	109,000
Incandescent lamps	92,160
Electric locomotives	85,640
Telephone and telegraph apparatus	23,280
Accumulators	12,400
Porcelain insulators	6,960
Electrodes and carbons	5,640
	£2,355,600

Italy and Germany were the best customers for Swiss dynamos and motors, followed by Japan, Poland, Holland, Spain, Brazil and France. For electrical apparatus and instruments France was responsible for the major portion (16 per cent.), followed by Spain, Great Britain, Belgium and Italy. France and England were the best markets for cables, while France and Sweden took the majority of the electric lamps; Germany and Brazil led as regarded accumulators, and France and Belgium took the bulk of the insulators.

A German Electrical Company's Report.—The Bergmann Electricity Works Company, Berlin, whose financial results were recorded in our issue of May 21st, states that a steady revival in business took place in the first half of 1925, which, however, was succeeded by a diminution in the orders in the later months of the year. The measures of economy adopted by industrial works and public authorities contributed towards the decline in sales. As a consequence of the high rate of interest the construction or extension of hydro-electric works was of rare occurrence, although the company participated in the establishment of long-distance transmission lines and transformer works. In the turbine branch the home sales were small, but success was obtained by the transformer and switchboard branches. Owing to the unfavourable situation of the heavy iron and steel trades the sale of electric furnaces was unsatisfactory; otherwise the industrial department received large orders from the paper, chemical, sugar and food products branches. The railway department felt the decline in orders placed by the Reich railway authorities, although the overhead line section obtained contracts from the Austrian and Dutch railways. In the case of cables for heavy currents the turnover considerably increased, and the diminution in State orders for telephone and telephone cables was compensated for by other orders. Improved export trade is reported, orders having been booked for central station turbines and for the electrification of sugar works in the Dutch East Indies, despite foreign tariffs and severe competition. With regard to the current year it is stated that the decline in orders has ended and a slight improvement has taken place.

Unemployment.—The number of persons registered at the Employment Exchanges on May 24th was 1,597,000. This total was 15,044 less than that of May 17th, but 411,178 more than on May 25th, 1925. In addition, claims had been presented by 307,000 persons thrown out of work on account of the lock-out in the coal industry.

British Traders in Australia.—According to the fifteenth annual report for the year ended December 31st, 1925, the membership of the Australian Association of British Manufacturers and their Representatives at the close of last year numbered 1,082, composed of 544 British manufacturers and 538 Australian representatives of British manufacturers, an increase of fifty-nine during the year. Mr. R. W. Knox, President of the Association, has arrived in London, and will be pleased to see members and others interested in Australian trade, by appointment, at the offices of the Association, Room 605, Australia House, Strand, London, W.C.2. (Telephone, City 9880.)—*Board of Trade Journal.*

Stoker Contract.—MESSRS. E. BENNIS & CO., LTD., have received from Messrs. Charles Macintosh & Co., Ltd., of Manchester, an order for five sprinkler stokers and five independent bucket elevators, for their set of five Lancashire boilers.

A Deserving Cause.—We are asked to draw attention to the Diamond Jubilee of Dr. Barnardo's Homes—a national charity whose funds, like those of many other excellent institutions, suffered severely through the General Strike. We commend this very worthy object to the generous support of our readers. The celebration takes place on June 26th, the Duke of York presiding.

New French Company.—A company has lately been formed in Paris (13, Rue du Quatre Septembre), with a capital of 500,000 fr. and the title La Société Electro-Chimique Phœnix.

The Norwegian Domestic Electrical Market.—From an article upon the above subject in a recent issue of *Commerce Reports* it is gathered that practically all Norwegian homes are equipped with electrical appliances of some sort or other. Cooking equipment and washing machines are not in general use, although hot-plates are very commonly found. The market is satisfied to a great extent by native or Swedish manufacturers. The imported appliances are mainly German or American. The Norwegian manufacturers of electrical appliances have retail distributing shops or sell directly to retail hardware shops and electrical equipment stores.

Conditions in Central America.—The Department of Overseas Trade has published a series of reports upon conditions in Central American states. Mr. H. Apfel, acting British Consul-General at Guatemala, reports that in that republic the demand for electrical appliances is increasing owing to the development of hydro-electric power. In the supply of these goods the United States and Germany predominate, but there should be an opening for British manufacturers, provided that prices are competitive and the requirements of the market are carefully studied. Unsuitable representation is often the cause of loss of orders. The shortage of reliable local agents could be overcome by the co-operation of manufacturers or shippers of non-competitive lines, and local representation should be strengthened by periodical visits by travelling salesmen. Punctual delivery is essential, as that is one of the advantages gained by the United States, owing to its proximity. During the past year a contract for the installation of an automatic telephone system in Guatemala City was awarded to the A.E.G., Berlin. Competition in the Republic of Honduras is mainly American; Germany has recovered the market which she lost during the war in cheap goods, but she offers little competition to British goods, according to Mr. A. H. King, British Consul at Tegucigalpa. In Salvador (states Mr. H. C. Swan, acting Consul at San Salvador) there is a bias in favour of American products, but an appreciation of United Kingdom manufactures is not lacking, and there is no reason why the imports of British goods should not be increased. Manufacturers are warned to be careful of their choice of representatives. The 1923 import statistics (the latest available) show electrical machines to the value of $69,280 (as against $70,495 in 1922). Great Britain supplied motors, boilers, and turbines to the value of $5,508, electrical material valued at $273, and electrical machinery valued at $41. A report on Costa Rica, by Mr. F. N. Cox, British Consul at San Jose, shows that during 1924 electrical goods to the value of £54,780 were imported by the Republic. The reports on Guatemala, Honduras, and Salvador are combined, and can be obtained at 2s. net from the Stationery Office. The report on Costa Rica is combined with one on Panama, and costs 1s. net.

New Italian Companies.—Among the new electricity supply undertakings lately organised in Italy are the Società Elettrica Centro Lario, Milan, capital, 600,000 lire, and La Società Elettrica Teramo, Genoa, capital, 2,000,000 lire.

Book Notices.—"Faraday House Journal."—In the summer term issue of this well-produced organ, Mr. H. Rainford deals with "Flameproof Mining Electrical Apparatus"; Mr. B. J. Rowe writes on the "Protection of Alternators"; and Mr. H. E. M. Kensit indicates the "Financial Value of Education." Some of the students seem to have enjoyed their experience as volunteers during the general strike, the effect of which has been to prolong the term to July 27th.

The *Journal* of the South African Institution of Engineers. Vol. XXIV, No. 10. May, 1926. Price 2s.

"House Telephone Systems."—A recent revised issue of "Technical Pamphlets for Workmen," by the Post Office Engineering Department. H.M. Stationery Office. Price 6d. net.

"The *Transactions* of the South African Institute of Electrical Engineers." Vol. XVII, Part 4; April, 1926. Price 2s.

Social Event.—The Union Cable Co., Ltd., entertained a party from the Borough of Kingston-on-Thames Electricity Works, on their Sports Ground at Dagenham, on Saturday, 5th inst. Both sides were strongly represented, and keenly contested the cricket and lawn tennis matches that were played. Mr. T. A. Kingham, A.M.I.E.E., borough electrical engineer of Kingston, and Mr. J. Snow Huddleston, M.I.E.E., general manager of the Union Cable Co., were present.

Views on Australian Protection.—The recent statement by Sir John Monash (reported in our last issue, p. 831) that the high tariffs on imported articles handicapped the extension of the use of electricity, has aroused a storm of protest from Australian electrical manufacturers. One of them states that, on the contrary, protection has led to reductions in prices. He quotes electricity meters as an example and avers that immediately a local industry started the prices fell by 50 per cent. It is also stated that in a recent competition for a switchgear contract in New Zealand, an Australian manufacturer was able to underquote competitors in Great Britain and the United States. Another manufacturer says that in 1925 the prices of Australian electrical apparatus compared favourably with those for similar appliances in other large industrial countries, and that it is not the cost of appliances but the cost of electricity which is the handicap. The secretary of the Australian Industries Protection League stated, according to the Melbourne *Herald*, that Sir John Monash did not seem to grasp the fact that his undertaking (the Yallourn electricity scheme) could not succeed without the establishment of secondary industries, and that that could only be done by the protection afforded by the tariff. "The more people there are engaged in industry the greater demand there will be for electricity for lighting, and there will be a greater demand for electrical appliances, thus leading the way to mass production. Then, as in the case of other locally-made products, there will be a reduction of prices, and all will benefit."

Imperturbable Lamps.—On Friday last week the showrooms of the Edison Swan Electric Co., Ltd., Queen Victoria Street, E.C.4, were severely damaged by a loaded 12-ton lorry which got out of the driver's control and crashed into the windows. The concussion was terrific, but in spite of it the "Ediswan" lamps in the window continued to burn.

For Sale.—The Director of Army Contracts invites offers for one G.E.C. 150-kW rotary converter, with starter, &c. (See our advertisement pages to-day.)

Lighting and Power Notes.

Australia.—MELBOURNE.—The *Electrical Engineer of Australia and New Zealand* states that the City Council is making arrangements with the Victorian Electricity Commission to take further bulk supplies of electricity to the extent of 2,000 kW. At present the Council is taking a minimum of 10,000 kW and a maximum of 11,000 kW. Its own generating plant has a capacity of 27,000 kW.

CLARENCE RIVER.—The first report on the County Council's Nymboida hydro-electric undertaking, for the year ended December 31st last, shows a total revenue of £11,747, and working expenditure of £4,976. After meeting capital charges, there was a net deficit of £2,337. The sales of electrical energy amounted to 720,809 kWh and the capital expenditure was £161,000. The engineer and manager of the undertaking is Mr. H. V. S. Wilton.

Basingstoke.—OPPOSITION TO SCHEME.—The Rural District Council and the Town Council have given notice of opposition to the application of the Aldershot Gas, Water, and District Lighting Co. for a Special Order to supply electricity in the parishes of Newnham and Natly Scures. The Town Council has asked the Commissioners to postpone the hearing of the application so as to give the Corporation time to study the figures as to the cost of supplying the parishes named from its own undertaking. The Rural District Council has asked the Corporation to state definitely within three months whether it intends to supply the parishes in question.

Canada.—ELECTRICAL DEVELOPMENT.—The Shawinigan Water and Power Company has recently completed arrangements with the Duke-Price Company for the supply of 100,000 h.p., which, it is understood, will be transmitted to the City of Quebec or the immediate vicinity.

What will be the highest voltage transmission line in Canada, and one of the longest in America, will be installed between Ile Maligne and Quebec in the course of the summer. This line will be about 150 miles in length, and the voltage will be 150 000. It is expected that the construction of the new line will be completed early in 1927.

The Premier of Ontario has announced that the Government has authorised the completion of an agreement for the delivery by the Gatineau Power Company at the inter-provincial boundary, in the vicinity of Ottawa, of from 230,000 to 260,000 h.p. of hydro-electric energy at a price of $15 per h.p. Delivery will commence with a supply of 80,000 h.p. in 1928, and the total delivery is to be completed in 1931. The contract is for 30 years, dating from 1928. The energy will be transmitted at a point near Ottawa to connect with the Niagara system near Toronto. The transmission lines will be approximately 230 miles in length, and will require an expenditure of from $10,000,000 to $15,000,000. Construction of these lines will be commenced immediately.

A $500,000 estimate for preliminary work was voted during the recent session of the Ontario Legislature.

An agreement has been completed under which the International Paper Company will develop Grand Falls on the St. John River, producing approximately 50,000 h.p.

Chester.—LOAN SANCTIONED.—The Electricity Commissioners have given sanction to the borrowing by the Corporation of £20,000 for mains and additional works in connection with the distribution of electricity.

Continental.—SWITZERLAND.—Negotiations are proceeding between the St. Gall-Appenzell Electric Power Co., and the authorities of the Canton of Glarus, for the construction of a large hydro-electric power station to utilise the water power of Lake Muttern, the Limmern Falls and the Upper Linth River in East Switzerland. The scheme has been under consideration for some years, the original idea being to establish, in two stages, only a winter-period generating plant, the first stage providing for an output of 22½ million kWh, with a later extension to 39 million kWh. A new scheme has now been drawn up which provides for a 115,000-h.p. station, capable of being run the whole year round. Lake Muttern would supply the water in winter, with the Limmen Falls intake as a supplementary feeder, while the River Linth would furnish the power in the summer. The conduit pipes will all be concentrated on a single generating station which will be built at Tierfeld, near Linthal. The cost of the installation is estimated at £2,058,400.

FRANCE.—Some interesting particulars of the hydro-electric development in France are given in a recent issue of the *Revue Industrielle*, which estimates that water power to the extent of 10 million h.p. is available. It is also estimated that whereas the capacity of the hydro-electric plants in operation prior to the war was only 550,000 kW, it now amounts to over 2 million kW, of which 1,233,000 kW is furnished by plants of a capacity of more than 1,000 kW. At the present time work is in hand on the establishment of new stations representing a total of about 350,000 kW.

Halifax.—LOAN.—The Corporation Electricity Committee is seeking sanction to the borrowing of £30,000 for extensions to the electricity mains and the erection of a tramway shelter at Shelf.

Kingston-on-Thames.—YEAR'S WORKING.—We have received from Mr. T. A. Kingham, borough electrical engineer, a copy of his report, together with the statement of accounts for the year ended March 31st last. The trading account shows a total income of £56,388 and working expenditure of £22,444, leaving a balance of £33,946, which was transferred to profit and loss account, together with items from other sources of revenue, making a total of £36,703. After meeting capital and other charges there was a net surplus of £6,672, which was carried to appropriation account, together with a balance from the previous year of £10,896, making a total of £17,568 available, of which £3,000 was contributed to the borough fund and £14,568 carried forward. The capital expenditure during the year amounted to £24,994 and included £14,211 for mains and services A new 3,000-kW turbo-alternator and a new boiler were put into commission during the year, and the conversion of the system of supply from single-phase to 3-phase was continued.

Liverpool.—LOAN SANCTIONED.—The Electric Power and Tramways Committee has received sanction to the borrowing of £2,616 for mains and services in connection with the supply of electricity to the Springwood housing estate.

Manchester.—PROGRESS DURING APRIL.—During the month of April the Corporation electricity undertaking showed an increase in connections of 2,626 kW, bringing the total to 282,194 kW; and the number of applications received for supply, including consumers for additional supplies, was 767, representing a total of 2,365 kW. The number of hired cookers connected increased by 116, bringing the total actually on circuit to 1,612. Applications for the hire of cookers totalled 129.

Mid-Cheshire.—PROPOSED CHANGE-OVER.—The Mid-Cheshire Electricity Supply Co., Ltd., is to apply for consent to change over its system of electricity supply in certain districts from 3-wire d.c. at 220 V to a.c. 3-wire, 50 cycles, 220 V.

Newport Pagnell.—ELECTRICITY SUPPLY.—The Rural District Council has consented to the Northampton Electric Light Co. erecting overhead h.p. lines from Wolverton to Bletchley, and to the erection of l.p. overhead distributing mains at Water Eaton.

New Zealand.—ELECTRICAL DEVELOPMENT.—According to the *Electrical Engineer of Australia and New Zealand*, owing to the increasing demand for electricity, the Dunedin City Council has recently approved proposals for considerably increasing the capacity of its hydro-electric power station. Two alternatives were investigated: one involving the raising of the dam to a height of 110 ft., the construction of a tunnel 4¼ miles in length, and the building of an entirely new power station, and the other providing for utilising the increased head made available by the raising of the dam from 40 ft. to 60 ft., and extensions to the existing power plant. The latter proposal was accepted, as the capital expenditure was less than for the former, and also because the development is to be progressive, and certain of the new plant will be put into service at a comparatively early date. The adopted proposals provide for the immediate construction of a subsidiary power station of 3,000 kW capacity just below the dam at Waipori Falls; the cutting of a second tunnel from the weir to the existing surge chamber and the laying of a new pipe line from the surge chamber to the power house; the replacement of the six present 1,000-kW sets in the power station by 3,000-kW sets, and the construction of a further tunnel and 3,000-kW subsidiary power station. The complete scheme will provide an installed capacity of 27,000 kW.

The Public Works Department proposes to construct main transmission lines that will undoubtedly link up the Waipori Falls station with the Lake Coleridge development in the north and the Lake Monowai development of the Southland Power Board in the south. A 110,000-V line that will form part of this link is at present under construction by the Department from Lake Coleridge to Oamaru.

POVERTY BAY.—The ratepayers of the Poverty Bay Electric Power Board's district have sanctioned the raising of a loan of £280,000 for the electrification of the district from the Government power station at Waikaremoana.

Northern Ireland.—BELFAST.—The accounts of the city electricity undertaking (engineer: Mr. Johnstone Wright) for the year ended March 31st last record a total revenue of £355,753, as compared with £341,273 in the preceding year. The cost of production was £144,467, an increase of £678, leaving a gross profit of £211,286 (£197,913). After providing for capital and other charges there was a net surplus of £62,402 (£64,961). Reductions equivalent to a revenue of £10,000 were made in the charges for electricity during the year. The sales of electricity amounted to 45,086,797 kWh, an increase of 4,879,237, as compared with 1924-25. In his report for the year, Mr. Wright proposed further reductions in the charges, but advised that the date for putting the new scale in operation be left in abeyance until the full effect of the coal dispute was ascertained.

Nuneaton.—INQUIRY.—On June 1st and 2nd, Colonel T. C. Ekin conducted an inquiry, on behalf of the Electricity Commissioners, into an application by the Corporation for consent to extend its generating station. Mr. R. A. Willes, barrister, for the Corporation, said the Leicestershire and Warwickshire Electric Power Co., Ltd., had for some time past been supplying electricity in bulk to the Corporation, and notice to terminate the agreement was given by the latter some time since. The company had made certain offers to the Corporation. He gave figures showing the respective costs of local generation and bulk supplies up to the year 1933. Mr. E. M. Lacey, consulting engineer, said the estimated capital expenditure on the extensions was £77,550. He was convinced it was cheaper to generate locally than go to the company for a supply in bulk. The extensions would ensure an additional 3,000 kW. Mr. S. C. Gibson, electrical engineer to the Corporation, said that several of the largest consumers were asking for more reasonable terms, and had hinted that unless these were conceded they might set up their own installations or remove their works to other districts. He thought the proposed extension would tend to cheaper production. For the company it was stated that its reason for opposing the Corporation's application was that it considered it could supply electricity more cheaply. If the Nuneaton works were extended, the site would not be sufficient in a few years' time. The Commissioners will give their decision in due course.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

CHELMSFORD.—*The Electric Supply Corporation, Ltd.*—From 10½d. to 9d. per kWh. During the continuance of the restriction in the use of electricity the minimum charge will not be enforced.

WORTHING.—Lighting: 6d. per kWh. Heating and power: 1½d. per kWh. Kinemas, &c.: 4d. per kWh.

Plymouth.—NEW PLANT.—The Electricity Committee has obtained sanction to the extension of the existing generating station at Prince Rock, by the installation of one 7,500-kW, 3-phase, 50-cycle turbo-alternator, together with the necessary auxiliary plant. The Committee has authorised cable extensions at a cost of £4,500.

Reigate.—LOAN.—The Town Council has applied for sanction to a loan of £18,000 for a fourth engine and alternator, switchboard, &c., and the cost of replacing the three 4-cylinder engines by three 6-cylinder engines.

Retford.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £33,580 in connection with its electricity scheme for the district.

Sheffield.—ELECTRICITY EXTENSIONS.—During April the Corporation Electricity Committee approved extensions and works and extensions of mains for general distribution purposes, at an estimated cost of £20,116.

South Africa.—WITBANK.—Shortly before midnight on April 30th, No. 1 20,000-kW generating set at Witbank was connected, *via* step-up transformers, to the 132-kV transmission circuit for test purposes. All being in order, the set was shortly afterwards paralleled with the Victoria Falls Power Co.'s system at the Brakpan end, and carried a small load for a short time. On May 3rd the set commenced commercial operation, and, according to the *S.A. Mining and Engineering Journal*, there is an appreciable amount of extra load awaiting the company, notably the additional ten tube mills in the Government areas, so that set No. 1 Witbank will be called upon for its full output as soon as it has passed through its probation period, and its connection to the Witwatersrand system, hitherto without spare generating plant, will be a source of relief and satisfaction to consumers and station operatives alike. Although other sets of similar size and speed are already in operation, No. 1 Witbank is a representative of the largest units running at 3,000 r.p.m. in the world.

Southport.—ELECTRICITY IN BULK.—After considering an application from the Birkdale District Electric Supply Company, Ltd., for a reduction in the charges for the bulk supply of electricity to the company, the Electricity Committee has provisionally agreed on reduced charges to be embodied in a new agreement.

Special Orders.—Applications have been made to the Electricity Commissioners for Special Orders by the following authorities:—The Crewe Corporation, to extend its area of electricity supply so as to include certain parts of the rural district of Nantwich; the Cranleigh Gas and Coke Co., Ltd., to supply electricity in parts of the rural district of Hambledon; and the Midland Electric Light and Power Co., Ltd., to supply in certain parishes in the rural districts of Lutterworth and Rugby.

The Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Rural District Council of Plympton St. Mary to supply electricity in the rural district.

Stoke.—EXTENSION OF SUPPLY.—The Electricity Committee has decided to lay cables to the Abbey Hulton Estate at a cost of £5,000, and to erect a sub-station at a cost of £2,000.

Sutton Coldfield.—EXTENSION OF SUPPLY.—The Town Council is to extend its electricity supply to Little Aston and Streetley and to erect a new sub-station at Streetley, at a cost of £11,560.

Torquay.—LOAN SANCTIONED.—The Electricity Committee has received sanction to the borrowing of £1,000 for transformers and switchgear for Newton Abbot power station.

Wakefield.—LOANS.—The Electricity Committee is applying for sanction to the borrowing of £10,000 for sub-stations and transformers, and £6,000 for meters.

Wimbledon.—LOAN.—The Electricity Committee is to apply for sanction to a further loan of £10,000 for the purchase of electrical domestic appliances to be let out on hire.

York.—"ALL-ELECTRIC" HOUSE CHARGES.—The Housing Committee has accepted the terms of the Electricity Committee in connection with the supply of electricity to the "all-electric" houses as follows:—Standing charge of 9d. per week, plus .675 per kWh, equalling, on an estimated consumption of 60 kWh, a total charge of 4s. 1d. per week per house.

LOAN.—The Electricity Committee is applying for sanction to a loan of £17,000 for mains and services.

Tramway and Railway Notes.

Bradford.—TRACK RENEWALS.—At its specially-convened meeting, on May 28th, to consider whether it should carry out the scheme for relaying the Manningham Lane tramway track, at a cost of £27,715, or suspend it in favour of a modified scheme of patching up until such time as the tramways could be gradually changed over to motor-'bus services, the City Council decided that renewal of the track in full should proceed forthwith. There were protests from the Bradford Chamber of Commerce, the Chamber of Trade, the Property Owners' and Ratepayers' Association, and a petition signed by traders in Manningham Lane.

The Tramways Committee has decided to recommend the Council to rescind its decision to renew a portion of the tramway track from Four Lane Ends to Allerton. It had been decided to replace the single track on this route by a double track at an approximate cost of £20,000.

Burnley.—TRACK RENEWALS.—The Tramways Committee proposes to spend a sum of £14,000 on relaying a portion of the tramway track.

Colne.—NEW CARS.—The Ministry of Transport has sanctioned the borrowing by the Town Council of £6,305 for the purchase of three new tramcars and two new tramcar trucks.

Continental.—BELGIUM.—The Société Nationale des Chemins de Fer Vicinaux, of Brussels, is electrifying about 14 miles of its steam local railways in the Louvain district, a first section having recently been completed and put in operation.

SWITZERLAND.—The Swiss Federal Railway authorities in Berne have recently voted a credit of £592,000 towards the cost of electrifying the railway between Yverdon, Biel, and Olten, a distance of about 78 miles.

Huddersfield.—TRACK RENEWALS.—The Corporation is to relay the tramway track between the top of Viaduct Street and Blacker Road.

Irish Free State.—DUBLIN AND LUCAN TRAMWAY.—The Dublin United Tramways Co. has informed a deputation representing the unemployed in Dublin and Lucan that the laying of the tramway to Lucan, which is expected to provide work for 600 men, will be undertaken as soon as possible. The Tramways Company estimates that, owing to the unsuitable gauge, worn-out rolling stock, and an obsolete power station, an expenditure of £70,000 would be needed to put the Lucan line into working order. The company, however, has decided to open the line, provided that the Borough Commissioners and the Councils in the towns grant an extension of their leases of the line in the city. The City Commissioners, the Dublin County Council, and the Blackrock Urban District Council have agreed, but the Rathmines, Pembroke, Kingstown, and Dalkey Councils still withhold their consent, the obstacle being the payment by the company of a road grant.

Manchester.—DEPOT EXTENSIONS.—The Corporation is to provide increased tramcar depôt accommodation, at a cost of £300,000.

South Shields.—LIGHT RAILWAY ORDER.—The Minister of Transport has made an Order in favour of the South Shields, Marsden, and Whitburn Colliery light railway scheme.

Sunderland.—TRAMWAY IMPROVEMENTS.—The Tramways Committee has decided to double the present single tramway track from Spelter Works Road to the Grangetown terminus, at an estimated cost of £7,000.

Telegraph and Telephone Notes.

International Telegraph Union.—PROGRESS IN 1925.—In a recent issue of the *Journal Télégraphique*, the official organ of the International Telegraph Union, a brief summary is given of the extension of the world's telegraph system during 1925 and of the progress of the Union. Thus it is stated that Southern Rhodesia and the Tanganyika Territory joined the Telegraph Convention and that Ecuador and Colombia are following their example; Lithuania, the French Somali Coast, and the Republic of Honduras also joined the Wireless Telegraph Convention. Among the new submarine cables brought into use during the year were one between England and Spain, one between New York and Bay Roberts, one between Bay Roberts and London, one between Victoria in British Columbia and Suva (Fiji), one between Emden and the Azores, and one between Marseilles and Phillipeville. The most important new service of the year was, however, that inaugurated by the Compagnia Italiana dei Cavi Telegrafici Sotto-Marini between Italy and North and South America; this company inaugurated a service between Spain, the Azores, and America in January, 1925, and between Anzio and New York in February, and between Italy and Brazil, Argentine, Uruguay, and Chile in September. The Italian-South American cable covers a distance of 7,250 miles in the following sections:—Anzio-Malaga, 990 miles; Malaga-Las Palmas, 850 miles; Las Palmas-St. Vincent, 937 miles; St. Vincent-Fernando de Norontia, 1,476 miles; Fernando de Norontia-Rio de Janeiro, 1,687 miles; Rio de Janeiro-Montevideo, 1,202 miles; and Montevideo-Atalaya, 108 miles. In addition, Anzio is connected with Rome by two land lines (37 miles) and Atalaya with Buenos Aires by a single land line (78 miles).

As regards international wireless telegraphy, the report states that last year communication was established between Poldhu (England) and Milverton, near Cape Town; between Holland and the Dutch East Indies; between Italy and the United States; between Italy and Egypt; between France and China; between Belgium and the Belgian Congo; and between Panama and Barbados. It is added that notwithstanding the increased use of wireless telegraphy, the extensions of submarine cables that are taking place would appear to indicate that radio-telegraphy is not looked upon as taking the place entirely of wired telegraphy.

Police Telephones.—CONSTABLES' KIOSKS.—The Reigate Watch Committee is considering the adoption of the police telephone box system. By the recent adoption of this system in Newcastle it has been estimated that the town will make a saving on the rates of £13,000 through the substitution of 51 telephone kiosks for six out of the nine police stations now in use.

United States.—THE CAPITOL'S TELEPHONES.—To such an extent has the use of the telephone increased in the halls and offices of Congress and the Supreme Court that it has been necessary to increase the facilities by installing a new switchboard and associated apparatus. The Capitol's central telephone office is now of sufficient size to serve a city of about 15,000 population; it is known as "Main 3120" and has 120 trunk lines connected with the Washington offices of the telephone company and 80 direct lines to other private branch exchanges of the Government. Ultimately it is expected that this exchange will require about 200 trunk lines and 120 direct lines. Service is continuous throughout the 24 hours of the day; women serve as operators during the business hours, while men are on duty during the evening and night. The present switchboard consists of 18 positions, but is so arranged as to accommodate 17 additional units which will be sufficient to provide service for 3,000 telephones, says *T. & T. Age*. During the present session of Congress the Capitol office is handling about 27,000 calls daily, and this figure is constantly increasing.

Radio Notes.

Colombia.—PROPOSED STATION.—A broadcasting station with a range of 800 kilometres and a wave-length of 275 metres is planned in Colombia. According to *Commerce Reports*, bids have been called for the erection of the station.

India.—NEW COMPANY.—Prominent Bombay business men have floated the Indian Broadcasting Co., Ltd., with a capital of £112,500 in 10-rupee shares, of which 60,000 shares will be issued at present. The company will build stations at Calcutta and Bombay, which, says the *Daily Mail*, it is anticipated will be ready to transmit programmes next December.

Mexico.—NEW EQUIPMENT.—The installation of new 500-watt equipment was completed at the radio station in Chapultepec Park, Mexico City, last month, and will greatly increase the efficiency of communication, says *Commerce Reports*. The new station will use reduced-size antennæ of about 45 ft. in height. The old towers at this station are being dismantled, recut to size, and sent to various parts of Mexico for similar stations. At the Chapultepec Radio Laboratories work is progressing on a transmitter, similar to the one described above, which is destined for the city of Campeche.

Panama.—BROADCASTING INAUGURATED.—A broadcasting station was recently inaugurated at Balboa in the Panama Canal zone, and has resulted in a demand for crystal receiving sets.

Salvador.—RADIO DECREE.—The President of the Republic of Salvador has issued a decree setting forth new radio regulations; it abrogates one of May 1st, 1923, which has heretofore been the basis of radio control. Some of the principal provisions of the new regulations are that broadcasting shall be a Government monopoly, and that owners and managers of places of public entertainment may be required to permit the broadcasting of their performances. Foreigners will be permitted to operate receiving sets only when they renounce the right to present claims through diplomatic channels. An initial charge of 5 colones is made for receiving licences, and in addition thereto a monthly payment of 3 colones is required. The Government will install receiving sets for 30 colones; sets capable of regeneration are prohibited.

The B.B.C.—2LO BREAKDOWNS.—The London station of the British Broadcasting Co., Ltd., (2LO) experienced some trouble last week, apparently due to an insulation fault, and the old transmitter at Marconi House had to be brought into use for a time. It was also used on June 7th when 2LO again developed a fault.

Turkey.—BROADCASTING PROJECT.—A French company is negotiating for land at Yeni-Bagtche, below Stamboul, on which to erect a broadcasting station, according to *Commerce Reports*. Programmes from European stations will be relayed.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Asia Minor.—BAGDAD.—June 28th. Direction Générale des Chemins de fer d'Anatolie. One electrically-driven semi-portal crane. (A.X. 3191.)*

Australia.—MELBOURNE.—June 28th. Electricity Commission of Victoria. 22,000-V transformers and spares. (B.X. 2528.)*

August 23rd. 10-in. disk suspension insulators. B.X. 2614.)*

June 16th. Victorian Government Railways. One heavy-current motor generator set. (B.X. 2527.)*

July 14th. A.c. power interlocking machine. (B.X. 2526.)*

September 1st. Automatic sub-station equipment for Elwood sub-station. (B.X. 2598.)*

June 16th. City Council. Turbo-alternator, exciter and condensing plant.*

August 11th. H. and l.p., 3-phase sub-station switchgear.*

August 3rd. Postmaster-General's Department. Telephones and dials.*

August 10th. Telephone exchange indicators. (B.X 2597.)*

BRISBANE.—August 26th. City Electric Light Co., Ltd. One 12,500-kW turbo-alternator.*

Belfast. — June 12th. Electricity Committee. D.c. switchgear for sub-stations and transformer kiosks. (May 28th.)

Belgium.—June 26th. Belgian Post and Telegraph Authorities, La Salle Madeleine, Brussels. Telephone cable for Mons, Ath, Gramont and Hal. Particulars (Cahier des Charges Special No. 3-187) for 7½ fr.

Bentley-with-Arksey (near Doncaster). — June 22nd. Urban District Council. Tubing, wiring and electrical fitting of 32 houses and 16 bungalows on Jossey Lane housing site. Mr. P. C. Woodhall, engineer, Council Offices, Bentley.

Brazil.—PORTO ALEGRO.—July 8th. Municipal Council. Electrical material for street lighting. (B.X 2571.)*

Bristol.—June 14th. Electricity Department. Additions to the premises at Feeder Road generating station. (May 28th.)

Burnley.—June 26th. Joint Hospital Board. Electric lighting system at the Sanatorium, Marsden Road (June 4th.)

Colchester.—June 15th. Education Committee. Electric lighting installation at North Street schools. Mr. W. Frisby, borough electrical engineer.

Dublin.—June 24th. County Borough Commissioners. Arc lamp, carbons, electric cookers, and h.p. and l.p. circuit breakers. (See this issue.)

June 28th. One steam turbo boiler feed pump, three air filters, two electric vehicles, and steam and water meters. (See this issue.)

Dundee.—June 18th. Electricity Department. L.p. cable. (June 4th.)

Egypt.—CAIRO.—June 30th. Ministry of the Interior. One Diesel engine, direct coupled to an 80-kW generator, complete with switchboard. (B.X. 2537.)*

June 19th. Minister of Education. Dynamo and motors.*

July 10th. Director-General, State Domains Administration (Commercial Service), Savoy House, Qasr el Nil Street, Cairo. Three semi-Diesel engines and two centrifugal pumps.

August 2nd. Director-General, Mechanical Department, P.W.M., Cairo. 400-b.h.p. Diesel engine, driving an air compressor, together with auxiliary machinery.

Epsom.—June 14th. Electricity Department. Removal of boilers and setting them up as fuel tanks, overhead travelling crane, two 300-kW Diesel engine-driven generators and accessories, oil-purifying plant and cooling tower. (May 28th.)

Glasgow.—County of Dumbarton Education Authority. Electrical work, &c., and additions, &c., at Twechar Public School. Mr. B. P. Gibb, Master of Works, 18, Park Circus, Glasgow.

June 19th. Corporation. Electric light installation at Child Welfare Clinic, Tollcross. Forms from Office of Public Works, Cochrane Street.

Govan.—June 12th. Clyde Navigation Trust. Electrical stores, &c., from July 1st, 1926. Superintendent of Stores, No. 1 Graving Dock, Govan.

India.—June 15th. India Store Department. 70,000 (approx.) copper bonds for track rails. (May 14th and 21st.)

July 2nd. E.h.p. armoured switchgear. (See this issue.)

Leeds.—June 18th. Highways Department. One 550-V, d.c. motor, with switchboard, switchgear, &c. (See this issue.)

Lepton (near Huddersfield).—June 19th. Electrician's work required in alterations, &c., to Coloms Wesleyan Sunday school. Quantities from Stocks, Sykes & Hickson, architects, 4, St. Peter's Street, Huddersfield.

London.—METROPOLITAN ASYLUMS BOARD.—June 16th. Installation of electric cable for arc light treatment apparatus at St. Luke's Hospital, Lowestoft. (May 28th.)

June 16th. Installation of electric lighting at the Hut Building, Pinewood, Wokingham. (June 4th.)

H.M. OFFICE OF WORKS.—June 14th. Incandescent electric lamps. (June 4th.)

BERMONDSEY.—July 15th. Borough Council. Electrical installation for lighting, heating, and power at the baths and washhouses, Grange Road. (See this issue.)

Lurgan.—June 21st. Urban District Council. Oil engines and generators, motor-driven pumps, main switchboard, and underground and overhead mains. (June 4th.)

Manchester.—July 7th. Electricity Department. Two 130,000-lb. water-tube boilers, flues, coal chutes, ash hoppers, pipework, valves, induced- and forced-draught plant and chimneys, one 40,000-kW turbo-alternator, with condensing plant, &c. (June 4th.)

July 5th. 33,000-V trunk feeders, pilot cables, and telephone cables. (See this issue.)

New Zealand.—AUCKLAND.—June 21st. Electric Power Board. L.p. insulators, &c.*

Public Works Department. July 20th. Phase transformer for Mangahao electric power scheme.*

New Zealand Railway Department. June 16th. Electric motors.*

August 30th. 400-V, 3-phase, slip-ring induction motors and starters.*

CHRISTCHURCH. — October 19th. Christchurch Drainage Board. Three sets of electric centrifugal pumping plants. (A.X. 3215.)*

WELLINGTON.—August 24th. Public Works Department. Synchronous condensers for the Waikaremoana Electric Power Scheme (BX 2608).*

Rhyl.—June 16th. Electricity Department. 1,000 yd. l.p. armoured cable, 1,915 yd. 11,000-V feeder cable, and switchgear equipment. (May 28th.)

South Africa.—June 21st. South African Railways and Harbours. Track bonds for the Cape Town Suburban Railway electrification scheme. (May 28th.)

July 8th. Telegraph material, poles, cross arms, &c. (A.X. 3173.)*

Ulverston.—Wiring High Carley Fever Hospital, for electric light installation. Mr. H. S. Pursey, consulting engineer, Electricity Department, Theatre Street, Ulverston.

Uruguay. — MONTEVIDEO. — July 6th. State Electricity Works. 1,000,000 metres of insulated conductors. (B.X. 2523.)*

July 9th. 137,500 metres of rubber-insulated wires and cables. (B.X. 2548.)*

40,000 metres of coloured twin conductor cords. (B.X. 2549.)*

July 22nd. 35,000 electric lamps.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—MELBOURNE.—State Electricity Commission of Victoria. Accepted :—

Headworks, races, power-station buildings, &c., Sugarloaf-Rubicon hydro-electric scheme (approx. £155,083).—Sir W. G. Armstrong, Whitworth Pty., Ltd.

SYDNEY.—New South Wales Railways. Accepted :—

12 D.K. 55-h.p. traction motors (£4,307).—English Electric Co. of Australia, Ltd.

D.c. switchgear for St. Leonards and Hornsby sub-stations (£8,738).—Australian General Electric Co., Ltd.

—*Tenders.*

Belgium.—One Dutch, one British (Clark, Chapman and Co., Ltd., Gateshead), and five Belgian firms submitted tenders last week to the municipal authorities of Antwerp for the supply and erection of three electric cranes at the docks. The lowest offer was that of a Belgian concern.

Birkenhead.—Electricity Committee. Accepted:—

Cable.—Macintosh Cable Co., Ltd. (£2,648); W. T. Henley's Telegraph Works Co., Ltd. (£4,514); W. T. Glover & Co., Ltd. (£1,038).

500-kW rotary converter (£2,440).—Metropolitan-Vickers Electrical Co., Ltd.

Bolton.—Tramways Committee. Accepted:—

870 tons of Sandberg silicon steel tram rails.—Cargo Fleet Iron Co., Ltd.

Electricity Committee. Accepted :—

Steam meter.—Geo. Kent, Ltd.

Bradford.—Great Horton Industrial Society. Accepted:—

Electrical equipment at new branch stores.—Sackville Electrical Co.

Tramways Committee. Accepted :—

Six miles of round copper trolley wire (£569).—British Insulated Cables, Ltd.

75 tons of round mild steel (£694).—Whitehead Iron & Steel Co., Ltd.

Bury.—The Town Council has entered into an agreement with the Lancashire Dynamo & Motor Co., Ltd., in connection with the supply of the necessary plant for the change-over from direct to alternating current at Mossfield Mills.

Doncaster.—Electricity and Tramways Sub-Committee. Recommended :—

1,000-kW motor-converter and switchgear (£5,295).—Bruce Peebles & Co., Ltd.

Eastbourne.—Electricity Committee. Recommended:—

Feeder switch cubicles (£191).—Switchgear & Cowans, Ltd.

Fleetwood.—Corporation. Accepted:—

2,000-kW turbo-generator, one 20,000-lb. boiler, and the auxiliary plant.—J. Howden & Co., Ltd.

Glasgow.—

Electric lighting installation in connection with the restoration of West U.F. Church, Helensburgh.—Haddow & Co., Ltd.

Halifax.—Accepted:—

Wiring for electric lighting Corporation houses: Nursery Lane site (£200), Boothtown site (£200).—A. Higginbotham & Sons.

Hull.—Telephones Committee.

Silicum bronze wire :—

R. Johnson & Nephew, Ltd.	£428
British Insulated Cables, Ltd.	407
General Electric Co., Ltd.	419
T. Bolton & Sons. (Accepted.)	382
F. Smith & Co.	405
W. F. Dennis & Co.	359

Switchboards :—

Peel-Conner Telephone Works	173
Standard Telephones & Cables, Ltd.	189
British L. M. Ericsson Mfg. Co., Ltd.	162
Sterling Telephone & Electric Co., Ltd. (Accepted.)	158
J. McMillan & Co.	191

Ilford.—The Urban District Council has accepted the tender of the Metropolitan-Vickers Electrical Co., Ltd., for a 1,000-kW La Cour motor converter (600 revs. per min.) for £3,377, including specified spares. The Electricity Committee reported that it had received nine tenders from six firms. Particulars of four of these tenders were printed in the Council agenda, but the details were for some reason or other blacked out. It is reported that the committee recommended the acceptance of the tender of a Belgian company at between £300 and £400 less than the British offer, but this recommendation was not endorsed by the Council. We think that the blacking out of the particulars of tenders calls for some explanation. Councils or Library Committees sometimes think it their duty to black out betting news or matter not calculated to promote public morality, but is information relating to prices for public contracts to be placed in that category? A correspondent informs us that among the unsuccessful tenders were offers at £5,293 by the General Electric Co., Ltd., at £4,469 by Bruce Peebles & Co., Ltd., and at £3,000 by the Ateliers de Constructions Electriques de Charleroi.

India.—With further reference to our note on page 838 of last week's issue, *Indian Engineering* states that the contract received by the General Electric Co. (India), Ltd., for the complete equipment of a new power house for the East Indian Railway at Lucknow consists of :—Four 600-kW alternators; two Belliss engines for driving two of the above alternators; one 300-kW Belliss engine and alternator; one 12-panel h.p. switchboard; one l.p. switchboard; two 150-kW transformers, with condensing plant and other accessories. The value of the whole order amounts approximately to £22,000.

Leeds.—Electricity Committee. Accepted:—

Cable.—W. T. Henley's Telegraph Works Co., Ltd. (£5,135); Macintosh Cable Co., Ltd. (£3,516); Enfield Cable Works, Ltd. (£1,224); Hackbridge Cable Co., Ltd. (£1,095).

Leicester.—By 31 votes to 21 the City Council has accepted the tender of the Oerlikon Co., Zurich, for a 15,000-kW turbo-alternator at a cost of £28,000, rejecting an amendment that the lowest British tender be accepted. The debate was a keen one, and aroused some feeling. Councillor A. H. Swain, the chairman of the Electricity Committee, moving the adoption of the report, explained that ten tenders were received, eight being from British firms and two from Swiss manufacturers. He said that an examination of the British tenders "revealed the remarkable absence of free competition, while subsequent events proved that the prices were fixed by a combination of British manufacturers." The best two British tenders showed the minute difference of £50 per annum in the cost of producing 50 million units of electricity. The best tender was at £47,400, and an annual working cost of £16,035. The next was from the British Thomson-Houston Co., Ltd., at £45,761, and an annual cost of £16,035. The Swiss firm's price was £28,000, and the annual working cost £14,700. Calculated over 20 years, the period allowed by the Electricity Commissioners for the cost, the Swiss tender meant a saving of £46,100. Mr. Swain added that two further machines would have to be purchased during the next two or three years, so that had to be taken into consideration. As the Committee was anxious to give the work to British firms if it could, it took the step of permitting the British tenderers to reconsider their figures, and the matter was discussed with the British Electrical and Allied Manufacturers' Association. The principal points urged by the opposition were that the acceptance of the Swiss tender would tend to increase unemployment in this country and would seriously damage the prestige of British manufacturers. An attempt was made, without success, to secure the appointment of a special committee to go into the whole subject again.

Leigh.—Corporation. Accepted:—

One 750-kW rotary-converting plant.—Electric Construction Co., Ltd.

Maidenhead.—Town Council. Accepted:—

Extension of the h.p. switchboard (£315).—British Thomson-Houston Co., Ltd.

Plymouth.—Electricity Committee. Accepted:—

Transformers.—Metropolitan-Vickers Electrical Co., Ltd.

Meters.—Ferranti, Ltd., and Metropolitan-Vickers Electrical Co., Ltd.

Reigate.—Town Council. Accepted:—

H.p. switchboard, &c. (£1,739).—General Electric Co., Ltd.

Seaham Harbour.—Urban Council.

The following tenders were accepted in connection with the electricity scheme :—

Overhead line and l.p. switchgear.—Gray Bros.

H.p. cable.—F. Reid Ferens & Co.

H.p. switchgear.—Watson-Norie, Ltd.

Wiring houses on the Carr House site.—Harrison Bros.

Sheffield.—Tramways Committee. Accepted:—

1,000 tons of steel rails (£10 12s. 6d. per ton).—Steel, Peech & Tozer.

1,000 pairs of fishplates, at 16s. 6d. per cwt.; 250 pairs, at 12s. 6d. per cwt.; and 1,000 sole plates, at 12s. per cwt.—Cammell, Laird & Co.

19 tons of mild steel bars (15s. 6d. per cwt.).—Hadfields, Ltd.

Copper bonds.—British Insulated Cables, Ltd.; T. Bolton & Sons, Ltd.

4¼ miles bronze trolley wire.—T. Bolton & Sons, Ltd.

Electricity Committee. Accepted :—

750-kW automatically-operated traction sub-station equipment (£3,753).—English Electric Co., Ltd.

Two 500-kVA Scott-connected sets; one 250-kVA set; six 150-kVA 3-phase transformers; and twelve 100-kVA single-phase transformers (£4,013).—British Electric Transformer Co., Ltd.

Steam-operated air ejector, &c. (£520).—English Electric Co., Ltd.

South Africa.—JOHANNESBURG.—Union Tender Board. Accepted :—

Telegraph material.—Standard Telephones & Cables, Ltd.; H. Davies and Co., Ltd.

Municipal Council. Accepted :—

25 miles h.d. bare aluminium wire (£227).—Saaler & Franks, Ltd.

2½ miles twin cable (£242).—J. C. Ferguson.

Current transformers (£356).—Metropolitan-Vickers Electrical Co., Ltd.

Fifty 50-h.p. tramcar motors and spares (motors by Westinghouse Electric and Manufacturing Co.) (£8,219).—Paul Gregson, Urquhart & Co.

DURBAN.—Municipal Council.

5 tons bare copper wire (£407).—T. Barlow & Sons, Ltd.

1 mile 3 core h.p. cable (£387).—Bartle & Co., Ltd.

1 mile twin h.p. cable (£164).—W. T. Henley's (S.A.) Telegraph Works Co., Ltd.

8 sets Merz-Price protective gear for sub-stations (£339).—Metropolitan-Vickers Electrical Co., Ltd.

—*South African Engineer.*

Stockton-on-Tees.—Electricity Department. Accepted:—

Material for 12 months :—

L.p. cables.—W. T. Glover & Co., Ltd.

H.p. cables.—British Insulated Cables, Ltd.

A.c. meters.—Metropolitan-Vickers Electrical Co., Ltd.; Ferranti, Ltd.

House-service cut-outs.—W. T. Henley's Telegraph Works Co., Ltd.

Stoke-on-Trent.—Electricity Committee. Accepted:—

Circulating pump (£376).—Mather & Platt, Ltd.

Forthcoming Events.

Physical Society of London.—Friday, June 11th. At the Imperial College of Science, South Kensington, S.W. At 5 p.m. Ordinary meeting.

Salford Technical and Engineering Society.—Saturday, June 12th. Visit to the works of Messrs. Ferranti, Ltd., Hollinwood.

Faraday Society.—Monday, June 14th. At the Institution of Mechanical Engineers, Storey's Gate, S.W. At 2.30 p.m. Discussion on "Explosive Reactions in Gaseous Media."

Royal Institution of Great Britain.—Friday, June 14th. At 21, Albemarle Street, S.W. At 9 p.m. Lecture on "The Spectrum of the Aurora," by Prof. J. C. McLennan, F.R.S.

Incorporated Municipal Electrical Association.—June 14th to 19th. At Glasgow. Annual convention.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

STORA GEYSER electric water heater.
I.T.E. circuit breaker.

Notes.

The Electrical Engineers' Ball.—We are pleased to learn from the secretaries of the Electrical Engineers' Ball (Messrs. A. M. Sillar and W. S. Lonsdale), that owing to the great success of the Ball held on February 12th last, the Committee at a general meeting on June 3rd was able to distribute out of the surplus fund the sum of £65 each to the Institution of Electrical Engineers' Benevolent Fund and the Electrical Trades' Benevolent Institution. It will be remembered that with the Ball of 1925 the twenty-first anniversary of the event was celebrated, and it is very gratifying to be able to record that the total amount distributed to electrical engineering benevolence since the beginning has reached £1,280.

Board of Trade Committee on Patents.—The Board of Trade has appointed a Committee consisting of Mr. J. Whitehead, K.C. (chairman), Mr. H. A. Gill, M.A., Mr. A. J. Martin, O.B.E., Major-General Sir Philip Nash, K.C.M.G., C.B., and Mr. J. Swinburne, M.Inst.C.E., F.R.S., to inquire into and report whether any, and if so, what change is desirable in the practice of the United Kingdom of (*a*) dating and sealing patents applied for under Section 91 of the Patents Acts, 1907 and 1919, as of the date of the application in the foreign State; (*b*) dating and sealing other patents as of the date of application, as provided by Section 13 of the Acts. The Secretary to the Committee is Mr. B. G. Crewe, Patent Office, 25, Southampton Buildings, London, W.C.2, to whom all communications relating to the work of the Committee should be addressed.

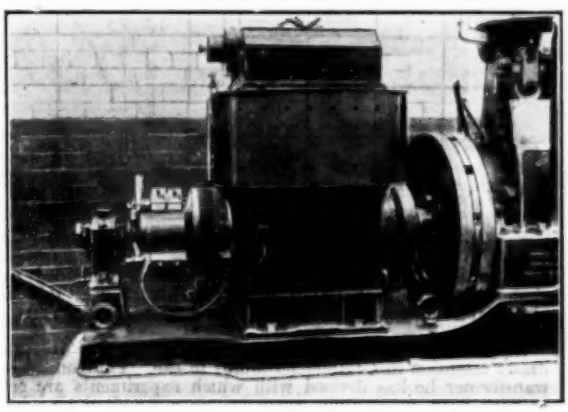
Electricity in Agriculture.—In France, according to *The Implement and Machinery Review*, the Department of Agriculture is giving particular attention to rural electrification, which is expected to serve the double purpose of attracting labourers to the farm and of supplying agriculturalists with a cheap and convenient form of motive power for all their farm operations. At the recent agricultural show in Paris, for example, there was held a series of conferences on the employment of electricity for ploughing and for other work, the object being to encourage husbandmen to use machinery wherever it may permit of increased production, and to convince the farmer of the economies to be realised with the aid of electricity. Lectures are being given in schools and elsewhere upon the practical side of electricity for farm work, with the idea of creating an interest amongst young people in electrical equipment.

The Department of Agriculture has instituted an inquiry into rural electrification with the view of ascertaining exactly what it is still possible to do. The work has been entrusted to an expert in each department, and in the Isère, which is the great centre of hydro-electrical distribution, a particularly interesting report has been prepared showing that out of the 564 communes no fewer than 480 are already being electrified. So great is the demand for electric power that in some of the mountainous districts a number of villages are defraying the cost of installation. The motors employed for farm machinery, such as chaff cutters, root pulpers, circular saws and pumps, range from 2 to 3 h.p. In the mountainous regions each farmer usually has his own thrashing machine, contrary to the usual practice in the agricultural districts where thrashing is more often done by contract. The power of the motors is from 4 to 5 h.p. Obviously, they must be employed for other purposes besides the thrashing of grain. It is reported that in the Isère the employment of small thrashing machines is increasing, apparently on account of the facilities offered for driving them electrically. As giving some idea of the cost of electric current supplied to farmers it may be mentioned that one company charges 60 centimes per kilowatt-hour, with an annual minimum of 60 francs per kilowatt.

Strike News in America.—A report by Sir Philip Gibbs on the electrical situation in London during the recent general strike, which is commented on and abstracted in the *Electrical World*, appears to rather exaggerate the facts of the case. The report suggests that in nineteen power stations in the metropolitan district the "crews" came out on strike and were replaced by men from warships. This does not harmonise with our own information, which is to the effect that in only a few cases were naval men employed, and these were obtained by the request of the undertakings concerned. In the majority of the stations independent volunteers were employed. It must also be understood that "crews" cannot mean the whole personnel of the stations; the technical staffs in all cases remained loyal to their undertakings and supervised the volunteers and naval ratings, and in some instances the whole of the manual workers did not strike.

Illumination Research.—A pamphlet on "Illumination Research" has recently been issued by the Department of Scientific and Industrial Research, and gives an indication of the wide range of the investigations on the proper utilisation of natural and artificial light which the department is conducting under the supervision of its Illumination Research Committee. Such matters as the relation between illumination and speed and accuracy of work in the printing and other trades; the design of reflectors; the access of daylight in picture galleries; and the effect of colour, distribution of light, and "flicker" on ease of work are being considered. In view of the enormous amount which is being spent annually in this country on lighting, the need for experiments in order to ascertain the best methods of using light and to encourage true methods of economy is evident. Good lighting is a subject of interest to the whole community, and there is no one who is not to some extent dependent upon it in his daily work. Copies of the pamphlet may be obtained from the above department, 16, Old Queen Street, Westminster, S.W.1.

Old Dynamos at Dover.—The accompanying illustration shows a Brush "Falcon" dynamo that has been in regular use at the Dover Electricity Works for over 30 years, during which period the repairs cost has been nil. This and a similar machine were part of the original equipment installed by the Brush Electrical Engineering Co., Ltd., and were designed by Mr. E. Kilburn Scott, M.I.E.E. The machine is rated at 190 A, 65 V, 250 r.p.m., and the following particulars of design, taken from the test sheet dated December, 1894, may be of interest to designers of to-day. The armature core is 12 in. in diameter and 18¼ in. long; it is wound with 176 conductors, each 0.138 in. by 5 in., connected at the ends with copper strips 0.025 in. thick, shaped in a volute to pack closely. The commutator has 88 segments. The shunt winding has 2,368 turns of 0.127-in. double-cotton-covered wire, eight turns of 1-in. by 0.25-in. wire comprising the series winding. The swivel bearing has two endless chains which were introduced as the result of experiments by Mr. Scott after seeing some Mohler bearings which were lubricated by a ring cut on the shaft. A swivel bearing with loose rings looked so clumsy that it was decided to use endless chains.



An Early "Brush" Dynamo at Dover.

The idea of using planished steel to protect the field coils came from Mr. Raworth, who designed the driving engine, which is fitted with electrical governors. The catalogue of these machines shows a range from 11 kW at 1,200 r.p.m. to 270 kW at 460 r.p.m., and it is interesting to know that these two sizes were priced at £110 and £990 respectively.

The Electrical Disturbances in Nerves.—According to *Science*, Dr. Adrian, of Cambridge University, has, by means of new radio apparatus, been able to obtain for the first time records on a rapidly-moving photographic plate of the electrical disturbance caused in a nerve fibre by the passing of messages down the nerve. The experiment was undertaken on a frog and it was found possible by stretching a muscle to stimulate a single nerve fibre. The impulses were all of the same size, but as the muscle was stretched, their frequency was increased from ten to fifty per second. The results of this experiment have opened up a new field of neurology, and no doubt they will hasten forward the time when it will be possible to read the types of messages entering and leaving the nervous system.

Silvanus Thompson Memorial Lecture.—The new date of this event has been fixed for Monday, June 28th, when Mr. C. A. Darling will lecture on "The Rise of Atomic Physics" with experiments, in the Dr. Thompson Lecture Theatre at Finsbury Technical College, Leonard Street, E.C.2. The chair will be taken by Mr. Llewellyn B. Atkinson at 8.0 p.m. Admission free by ticket only which can be obtained from Mr. R. O. Grant, c/o Messrs. Bloxam & Scuffels, Ltd, Engineers, 30, Bedford Row, W.C.1.

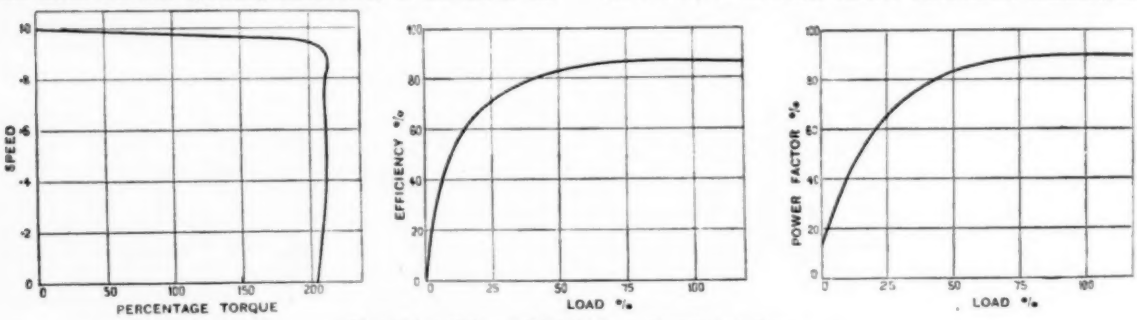
Earthing Resistances for Alternator Protection.—CORRECTIONS.—In connection with the article on this subject by Mr. B. Nuttall which appeared on pp. 822-4 of our last issue, the following corrections should be made:—Author's title, for A.M.I.E.E. read A.A.I.E.E.; in table on p. 824, for 1/1 read $1/1_c$; seventh line below the same table, for 1 read 1_c.

Fuel Economy.—At a Council meeting of the Institution of Fuel Economy Engineers, held in London on May 28th, it was decided that the following observations be forwarded to the hon. secretary of the proposed Institute of Fuel Technology:—

"The Council is unanimously of the opinion that professional qualification for full membership of a national fuel Institution is vital for the existence of such an Institution as an authoritative body on this essential industrial problem. For this reason the question of any merger must stand aside until you have finally decided upon your constitution. The Council hopes that on fuller consideration you may revise your present opinion on this essential point."

At the same meeting further applications for membership were passed, and the Council was pleased with the high status of many of the new members. Definite plans are now in hand for organising the autumn session, and the full programme will be available for members in good time before the session starts. The secretary will be pleased to receive suggestions.

Metropolitan-Vickers C.K.B. Motor.—The curves reproduced below have been taken from a 10-h.p., 3-phase, 50-period motor running at 1,460 r.p.m. on 415 volts, and are striking testimony to the excellence of both the starting and running characteristics of this motor. The C.K.B. motor has an improved form of double squirrel-cage rotor, and the curves show that there is practically no sacrifice in running power factor, nor has there been any sacrifice of mechanical robustness to obtain these electrical results. A motor taken from stock was recently put on the test plate and given 720 reversals per hour over a period of eight months for a varying number of hours per day till it had accomplished over 1,000,000 reversals. At each reversal the blow delivered on the periphery of the rotor amounted to 320 lb. In spite of this severe treatment, during which the temperature of the rotor rose to 111 deg. C., the motor was still operating satisfactorily at the end of the test, and the slip and general performance remained unchanged. Careful resistance measurements showed that its electrical condition was precisely the same as at the start.



Metropolitan-Vickers "C.K.B." Motor Characteristic Curves.

An Electric-Steam Locomotive.—Mr. W. P. Durtnall draws attention in *Commercial Motor* to the "Paragon" heat transformer he has devised with which experiments are said to have been successfully concluded on a standard six-wheel coupled goods locomotive, as a result of which it is claimed that the thermo-dynamic efficiency has been raised from 5 per cent. to nearly 20 per cent. Mr. Durtnall claims the "Paragon" electric-steam locomotive to be an improvement enabling steam locomotives to operate on electrified railways with higher electric dynamic efficiency even than that of the ordinary types of electric locomotives. The new locomotives, when descending grades or stopping, will, it is stated, regenerate and return to the supply lines no less than 40 or 50 per cent. of the electrical energy consumed in ascending the same grades at the same speed and load.

Combined Coal and Electric Ovens.—Some particulars have reached us from Switzerland of what is known as a "combined oven." This oven employs both electricity and coal indifferently; it is of no special construction, and the usual baker's oven is suitable. In the oven itself, or in the masonry, special heating elements are placed. The elements are only switched on during the night periods when electricity in Switzerland is cheap, and the ovens are coal fired during the day. It is calculated that 20 kWh is consumed per sq. metre for a night's baking, which includes two batches of bread with the full supply on, and light pastry which is cooked by the residue heat after the second batch is removed, the supply being switched off.

Greenwich Observatory.—The annual visit to the Royal Observatory, Greenwich, by the president of the Royal Society and the other members of the Board of Visitors took place on June 6th, when the Astronomer Royal, Sir Frank Dyson, read his report. The gradual advance of the Southern Railway's electrified train service through New Cross and Lewisham has so interfered with observations of magnetic declination that such observations as are being taken are of little value. "The complete electric train service is expected to be working from the middle of July next," said Sir Frank, "and magnetic observations at Greenwich will then cease." The Observatory has established a new station at Abinger, in Surrey, where the work will be continued.

Appointments Vacant.—Instructor in electrical installation for the Kingston-on-Thames Technical Institute; deputy engineer (£600), for the Windsor Electrical Installation Co., Ltd., and the Slough and Datchet Electric Supply Co., Ltd. (See our advertisement pages to-day.)

The Electricity Bill.—The following letter appeared in *The Times* of June 3rd, and is referred to in our leading columns to-day:—In view of the resumption next Thursday of the consideration of the Electricity (Supply) Bill by the Committee of the House of Commons, we desire to point out that although the Government has agreed to make certain amendments with regard to the status of the proposed Central Electricity Board and to constitute a Tribunal of Appeal, the impression which is being encouraged that therefore all is well with the Bill is not in our view justified.

We are not opposed to the principle of standardisation and interconnection, but we are satisfied that the cost of general standardisation of frequency has been seriously underestimated by the technical advisers of the Government and could not be borne by the electricity supply industry without imposing a burden upon the users of electricity. We are anxious to support any measures that are calculated to spread the use of electricity, whether by reducing the cost to the consumer or in other ways, but we have very serious doubts whether the methods proposed by the Bill will achieve this end. On the contrary, a careful study of the Bill in its present form has forced upon us the conviction that its provisions are inimical to the economic development of electricity supply.

It would make this letter too long to specify in detail the further amendments we consider imperatively necessary—they are being put before the Parliamentary Committee. We will content ourselves with adding that the Bill, unless further amended, will tend: (1) to diminish efficiency by unnecessary interference with responsible management through duality of control; (2) to introduce further bureaucratic administration without financial responsibility; (3) to discourage enterprise, the terms of compulsory expropriation being unfair to investors, and the prospects of earning a fair return on capital being endangered.

We are, Sir,
Yours faithfully,

J. B. BRAITHWAITE, Chairman, City of London Electric Lighting Company, Limited.
R. A. CHATTOCK, President of the Institution of Electrical Engineers.
JAMES DEVONSHIRE, Chairman, North Metropolitan Electric Power Supply Company.
E. GARCKE, Chairman, Shropshire, Worcestershire and Staffordshire Electric Power Company.
J. S. HIGHFIELD, Consulting Engineer to South Wales and Cornwall Electric Power Companies.
R. P. SLOAN, President, Incorporated Association of Electric Power Companies.
C. G. TEGETMEIER, Chairman of seven Electricity Supply Companies.
P. D. TUCKETT, Chairman, Edmundsons Electricity Supply Corporation, Limited, and Cornwall Electric Power Company.
W. B. WOODHOUSE, General Manager and Chief Engineer, Yorkshire Electric Power Company.

Lubricating Oils for Heavy-Oil Engines.—At a meeting of the Diesel Engine Users' Association on May 28th the President, Mr. E. W. Johnston, gave an account of the work which had been done by the Committee in connection with the preparation of specifications for lubricating oils for heavy-oil engines, which it was proposed that the Association should adopt, in the hope that they would be used by the members. Following independent analyses of a considerable number of lubricating oils used by its members, and with the assistance of a well-known analytical chemist and authority, the Association's Committee has prepared two specifications which embody characteristics which will ensure first-class lubricants without including any highly expensive features and which it will be practicable for the great majority of oil suppliers to provide without difficulty. At the conclusion of the investigations the Committee invited representatives of the principal suppliers in the country to express their opinions on the specifications, described as "A" and "B," adopted for lubricating oils for 2- and 4-stroke cycle heavy-oil engines, the first being for engines of speeds from 100 to 240 r.p.m., and the second for engines of speeds above 240 r.p.m.

Broadcasting during the Strike.—The absence of newspapers during the recent general strike added much value to the augmented news service which was maintained by the British Broadcasting Co.'s stations; in this connection it is of interest to record that the Radi-Arc Electrical Co., Ltd., was requested by the Government to install a "Liberty" 8-valve supersonic heterodyne receiver on the Horse Guards parade ground, operating two large loud-speakers, so that the Government news bulletins could be broadcast to the general public.

Strike Items.—At Edinburgh during the recent general strike most of the manual workers in the generating station and sub-stations left their posts. The supply was maintained by the technical staff, with the assistance of volunteers from the Heriot Watt College and local engineering firms; 589 employés left work and 94 volunteers were engaged. During the early part of the strike it was thought desirable to ask certain large consumers to curtail their consumption, but as things became better organised, this request was modified.

All the employés of the Greenock Electricity Department remained loyal, and no interference with, or curtailment of, the supply took place. Since the commencement of the coal dispute the undertaking has been using oil-fuel-burning equipment, with which many of the boilers were fitted during the 1921 coal strike.

A normal full supply was maintained at Blackburn, although a very large proportion of the employés at the main generating and distributing stations left work without notice. The station technical staff was assisted by members from the other departments.

A Local Lecture.—At a meeting of the Gosport Rotary Club on May 27th, when Mr. W. A. Homewood presided, Capt. W. H. Upton Marshall, M.I.E.E., delivered a lecture dealing with the electricity supply industry in this country. He outlined the advances which had been made during the past 20 years, and referred to the legislation which had been passed to ensure an adequate supply of electricity to all consumers. Referring to the recent proposals for shutting down the inefficient stations and interconnecting the large ones, he said that in the London and Home Counties alone some 500,000 tons of coal could be saved annually as the result of such reorganisation.

Institution Notes.

Institution of Electrical Engineers.—MERSEY AND NORTH WALES (LIVERPOOL) CENTRE.—The Committee's annual report for the 1925-26 session shows that eight committee meetings were held and six ordinary meetings, at which the average attendance was 98, excluding the attendance at the Faraday lecture. The number present at the annual dinner was 76; the reunion with the North-Western Centre which was to have taken place at Chester in May had to be postponed. The membership remains the same as last year, 467, and the number transferred to other districts, or removed from the list, was 89, as compared with 73 in the previous year. The total expenses of the session amounted to £283, including the Students' Section total of £17, which section is in a more thriving condition. The 1926-27 Committee is as follows:—*Chairman*: P. J. Robinson; *vice-chairmen*: Prof. F. J. Teago and S. E. Britton; *ordinary members*: A. G. Barnard, L. Breach, T. Cornfoot, H. Dickinson, P. M. Hogg, Prof. E. W. Marchant, T. B. Morgan, E. L. Morland, G. H. Nisbett, A. J. Pratt, P. Priestly, and A. S. Wilson.

The Faraday Society.—ANNUAL MEETING.—At the annual meeting on June 2nd, Prof. F. G. Donnan, F.R.S. (president), referred to the loss which the Society had sustained by the sudden and lamentable death of Mr. F. S. Spiers, the secretary of the Society, and also of the Institute of Physics. Mr. Spiers, he said, was practically the Faraday Society, and but for the work which he had done from the very beginning the Society would probably not now be in existence. The meeting marked its sense of the loss the Society had sustained by standing in silence.

The annual report of the Council for 1925 shows that 30 new members were elected during the year, and at the end of the year the membership was 426 members and 6 students, as against 416 members and 9 students in 1924. Regret is expressed that the membership is growing at such a slow rate, although there is a growing increase, from all over the world, in the sales of the *Transactions* to non-members. Reference is also made in the report to the formation of the Electroplaters' and Depositors' Technical Society during the year; the original idea was to form an electroplaters' section of the Faraday Society, but this was not thought desirable on general grounds, and as it was also found that a Plating Section would not serve the purpose in view, the new Society was formed practically under the wing of the Faraday Society. Prof. Donnan expressed the hope that there would be co-operation in every way between the two societies. The financial position at the end of 1925 was a debit balance of £187 due to commitments in the past, there being an actual excess of income over expenditure during 1925 of £332. By restricting the number of general discussions, for which the Society has achieved quite a reputation, to two per annum a considerable reduction in the expenditure is contemplated and, indeed, this is one of the reasons for the more satisfactory position at the end of 1925. On the other hand, it is intended to issue the *Transactions* bi-monthly in future, instead of three times per annum as in the past.

The report and accounts were adopted, the president expressing the hope that the membership would increase materially.

Prof. C. H. Desch, F.R.S. (Head of the Metallurgical Department of Sheffield University), was elected president for the coming year in succession to Prof. Donnan.

Prof. F. G. Donnan then delivered his presidential address, which consisted of an account of work done by himself and Prof. T. Thorvaldsen when they were both at Liverpool in 1912-13 upon electrical potential differences at air-water surfaces. This is the first time an account of this work has been given, the delay being due, in the first instance, to the fact that Prof. Donnan removed to London and Prof. Thorvaldsen took up a post in Saskatchewan, and then to the war period preventing publication. Subsequently Prof. Donnan wrote to Prof. Thorvaldsen to send his notes and documents over. These did not arrive until comparatively recently, hence the delay. The work dealt with the position as it stood in 1912 and 1913, although other workers had carried matters further since; it concerned the measurement of electric potential differences in thin films of liquid, a subject of great interest to colloid chemists. It was claimed that they established for the first time that electrical potential differences at air-water surfaces varied with the concentration of the substances and with the surface tension of the liquid.

Institute of Wireless Technology.—EXAMINATION.—We have received a copy of the regulations relating to the examination of candidates for membership of the Institute, together with application forms. The next examination will be held in October, and applications should reach Mr. Y. W. P. Evans, hon. secretary, 71, Kingsway, London, W.C.2, not later than August for Great Britain, and a month earlier for foreign candidates.

Institution of Heating and Ventilating Engineers.—SUMMER MEETING.—The summer meeting will take place at Scarborough from June 21st to 23rd.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements).

According to a *Reuter* report from Montreal, Mr. A. F. POLLARD, of the Department of Overseas Trade in London, has been appointed British Trade Commissioner in Vancouver in succession to Mr. L. S. BEALE, who has been transferred to New Zealand.

Mr. P. H. RIGGS has resigned his position of Scottish representative of Messrs. Richard Garrett & Sons, Ltd., Leiston, to join the Alton Battery Co., Ltd., Alton, Hants., as London representative.

Mr. CHARLES PARCELL, employed by the Liverpool Corporation Electricity Department as leading fitter, has been appointed assistant engineer in the electricity supply department (salary £300 per annum).

The Belfast City Council last week approved the recommendation of the Electricity Committee to send the City electrical engineer and manager (Mr. JOHNSTONE WRIGHT) to the United States to study electricity supply development in that country in general, but in particular power-station boiler-house practice and equipments utilising pulverised fuel, &c.

Mr. J. SIMS, assistant electrician at Broxburn Oil Works, has been appointed resident electrical engineer by Grange-over-Sands Council.

Mr. F. H. BLAXLEY, of Dovedale, Penns Lane, Erdington, Birmingham (late of the New Gutta-Percha Co.), has just been appointed Midlands representative of the Walsall Hardware Manufacturing Co., Ltd.

To fill the vacancy caused by the death of Mr. C. H. FRYER, Mr. W. H. SCAGELL, who for many years represented Messrs. Houghtons, Ltd., in Scotland and the north of Ireland, has now been appointed manager of their Glasgow depot at 70-78, York Street.

An Australian newspaper report states that Mr. JAMES CLARKE, sales manager of Standard Telephones and Cables (Australasia), Ltd., left on April 28th for England, the Continent, and the U.S.A. to study the latest methods of telephone manufacturing organisations, with the object of applying them to the Australian concern on his return there at the end of the year. It is remarked that the Company will be manufacturing telephone parts in Australia in the near future.

Last week the Halifax Town Council, by 22 votes to 20, adopted the Electricity Committee's recommendation that the salary of the borough electrical engineer be increased from £1,140 to £1,200.

Obituary.—MR. ROBERT TAYLOR.—We briefly mentioned last week the death of Mr. Robert Taylor, at the age of 71 years. The funeral took place at Manchester on May 21st (which date was given last week as that of his death). Mr. Taylor, who was the founder and a director for 25 years of the Liverpool Electric Cable Co., Ltd., had a long and interesting career in the cable manufacturing business, having been connected with its growth from the earliest stages. He was born at North Woolwich in 1855, and started work at the age of 10½ years. After a few months he got work with the India Rubber, Gutta Percha, &c., Co., on the winding of jute yarns for certain sub-

marine cable work, and in the coiling tanks, and then when the order was finished he went to W. T. Henley's galvanising shop, where he remained until he was about 14 years of age. At that time there were no Factory Acts, and boys could be worked overtime and at night; they worked alternate weeks, day and night shifts, each being for 12 hours. In some notes left by Mr. Taylor he says :—" No mealtimes were allowed so that we had to take food as best we could. It frequently happened that one's relief did not turn up so that we had to do a 36-hour shift. It is interesting to remember this when we think of the present-day conditions in the factory." He left the galvanising department on account of the fumes affecting his throat, and found a post again at the India Rubber, Gutta Percha, &c., Works. After a few months coiling in the tanks he was moved into the telegraph shop, where submarine cables were being insulated with vulcanised rubber. A fire destroyed the cable shop and in the course of other changes Mr. Taylor once again returned to Henley's, where he stayed until the end of 1872, and, after the troubled period, the foundation of the present prosperous business of W. T. Henley's Telegraph Works Co. was laid, with Mr. (now Sir) George Sutton as secretary. Towards the end of 1882 Mr. Taylor left Henley's and introduced the manufacture of vulcanised rubber cables to Johnson & Phillips, remaining there 5½ years. He then joined the Telegraph Manufacturing Company, Helsby, and commenced to manufacture rubber cables. Two years later he introduced to W. T. Glover & Co. the manufacture of rubber cables and took charge of the factory as works manager. After eleven years with Glover's, Mr. Taylor resigned and along with his son, Mr. W. S. Taylor, and the late Mr. Samuel Hartford, established the Liverpool Electric Cable Co., Ltd. Mr. Taylor was of a very reserved disposition, but he was well known to electrical men of an earlier generation. Of late years he was not able to take the place in the industry that he would have liked to occupy.

MR. F. C. OSBORNE.—The death occurred suddenly on May 25th of Mr. Frederick Charles Osborne, who was an engineer at the Colchester Borough Electricity Works. He was 53 years of age.

MR. W. T. EDWARDS.—The death took place as the result of a motoring accident at Brixworth, Northants, on May 30th, of Mr. William Thomas Edwards, who was partner with his father in the firm of Herbert Edwards & Son, radio engineers, of Clapham Park Road, London, S.W. Deceased was 22 years of age.

MR. W. P. THOMPSON.—We regret to learn from the columns of the *Mechanical World* that the death occurred on May 25th of Mr. William Phillips Thompson, patent agent, Liverpool. Mr. Thompson founded the firm of W. P. Thompson & Co., chartered patent agents, at Nottingham, in the early seventies of last century; he then opened at Liverpool, with, later, branches in Bradford and London.

MR. E. WARREN.—The death occurred on May 27th, at the age of 39 years, of Mr. Ernest Warren, who was engaged in the business of his father, Mr. W. H. Warren, electrical and radio engineer, High Street, Huntingdon. During the war he served in the electrical department of the Royal Engineers in German East Africa, and was in charge of the wireless apparatus.

New Companies Registered.

Mota Signs, Ltd. (214,053).—Private company. Registered May 31st. Capital, £250 in £1 shares. Objects: To carry on the business of dealers in all kinds of goods, apparatus and devices relating to electric or automatic signs for commercial advertising, &c. The first directors are :—S. Hamaguchi, 1, St. John's Wood Park, Hampstead, N.W.; Ivy P. Weaver, 1, Bisson Road, Stratford, E.15; J. T. Magee, 38, Leigh Road, Highbury; A. E. Weaver, 1, Bisson Road, Stratford, E.15 (all permanent, subject to each holding 10 shares). Qualification of ordinary directors, 5 shares. Registered office : 54, Gracechurch Street, E.C.3.

William Simms & Co. (Felixstowe), Ltd. (214,072).—Private company. Registered May 31st. Capital, £4,000 in £10 shares. Objects: To acquire the business of electrical engineers and contractors carried on by W. Simms and C. W. Barker at Felixstowe and elsewhere as " William Simms & Company. The directors are :—W. Simms, 2, York Road, Felixstowe, electrical engineer; C. W. Barker, " Binfield," Manning Road, Felixstowe, electrical engineer; C. R. Simms, 2, York Road, Felixstowe, electrical engineer. Qualification, 1 share. Solicitors: Kersey & Tempest, 15, Tower Street, Ipswich. Registered office: 92, Hamilton Road, Felixstowe.

Kemps Mills, Ltd. (214,040).—Private company. Registered May 29th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in radio apparatus and electrical materials of all kinds, manufacturers of and dealers in metals, engineers, metal workers, hardware merchants, &c. The subscribers (each with one share) are :—B. S. Bernstein, St. Hilary, Long Lane, West Kirby, Cheshire, manufacturer; E. J. Davenall, 48, Lea Road, Wolverhampton, radio engineer; A. G. Allen, 21, Legge Street, Parkfield, Wolverhampton, production engineer. The first directors are not named. Qualification, £1 share or stock. Secretary: F. E. Franks. Solicitor: F. W. Jackson, 57, Moorfields, Liverpool. Registered office: Pountney Place and Stewart Street, Wolverhampton.

W. Yuill & Co., Ltd. (24,165).—Private company. Registered in Edinburgh May 27th. Capital, £3,500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless sets, parts and appliances, optical and scientific instruments, pianofortes and musical instruments of all kinds, &c. The subscribers (each with one share) are :—W. Yuill, 20, Southern Avenue, Burnside, Glasgow, commercial traveller; A. Reid, Kilmory, High Road, Stevenson, Ayrshire, clerk. The first directors are not named. Qualification, 200 shares. Secretary: J. J. B. Gilmour, 83, Princes Street, Ardrossan.

McWhirr, Paterson & Co., Ltd. (214,065).—Private company. Registered May 31st. Capital, £1,000 in £1 shares. Objects: To acquire the loose stock, stock in trade and other goods and chattels (1) in connection with the business of McWhirr and Paterson, carried on by Mrs. J. D. Andrews at 20, Keen's Yard, St. Paul's Road, Highbury Corner, N.1, and (2) in connection with the business of George Paterson & Son (including the goodwill thereof) carried on by G. G. Paterson at 107, Clerkenwell Road, E.C., and to carry on the business of manufacturers of and dealers in screws, nuts, terminals, washers and all other wireless parts, components, accessories and sets for use for or in connection with the electrical and wireless trades, importers, exporters and manufacturers of brass parts, and fittings for builders, merchants, cabinet makers and general engineers, &c. The first directors are :—G. G. Paterson, 88, Belsize Lane, Hampstead, N.W.3, engineer; Mrs. J. D. Andrews, 43, Ilfracombe Road, Southend-on-Sea. Qualification, 1 share. Registered office: 7 and 8, Keen's Yard, St. Paul's Road, Highbury Corner, N.1.

Alphian Wireless, Ltd. (213,974).—Private company. Registered May 27th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of wireless sets and accessories, &c., and to adopt an agreement with Maude E. Adey. The permanent directors are :—H. O. H. Maude (chairman), 13, Rodney Court, Maida Vale, W.9; H. W. Adey, 10, Lambolle Road, Hampstead, N.W.3. Manager: H. W. Adey. Solicitors: Maude and Tunnicliffe, Arundel House, Arundel Street, W.C.2. Registered office: 99, Mortimer Street, W.1.

R. Falshaw, Ltd. (214,108).—Private company. Registered June 2nd. Capital, £5,000 in £1 shares. Objects: To acquire the business of an electrical engineer now carried on by R. Falshaw at 1, Albert Street, Harrogate, as " R. Falshaw," and to carry on the business of manufacturers of and dealers in wires, lamps, fittings, accumulators, batteries, dynamos, magnetos, indicators, bells, switches, controls, valves, telephonic and telegraphic instruments and apparatus, wireless goods, &c. The subscribers (each with one share) are :—R. Falshaw, The Lodge, Weeton, electrical engineer; Mrs. F. A. Falshaw, The Lodge, Weeton. R. Falshaw is first and permanent governing director and chairman. Qualification, £100 shares. Remuneration, £50 each per annum. Secretary: A. Depledge. Solicitors: Titley & Paver-Grow, Harrogate.

Official Returns of Electrical Companies.

Burndept Wireless, Ltd.—Charge on certain freehold and leasehold properties at Blackheath and Willesden, and the company's other assets, including uncalled capital, dated May 4th, 1926, to secure all moneys due or to become due from the company to Coutts & Co., not exceeding £100,000.

Frank Thornton, Ltd.—Agreement accompanying deposit of deeds dated May 11th, 1926, charged on garage and engineering works in Cannon Street, Burnley, with fixed plant, machinery, &c., to secure all moneys due or to become due from the company to Manchester and County Bank, Ltd.

Central Electric Supply Co., Ltd. (53,080).—Capital, £100,000 in £5 shares Return dated March 9th, 1926. All shares taken up. £100,000 paid. Mortgages and charges, £1,300,000.

Kensington and Knightsbridge Electric Lighting Co., Ltd. (26,193).—Capital, £350,000 in 50,000 ordinary, 10,000 first preference, and 10,000 second preference shares of £5 each. Return dated April 1st, 1926. 21,000 ordinary, 10,000 first preference, and 10,000 second preference shares taken up. £179,840 paid on 15,968 ordinary, 10,000 first preference, and 10,000 second preference. £25,100 considered as paid on 5,032 ordinary. Mortgages and charges, £140,000. Ditto guaranteed by this company and the Notting Hill Electric Lighting Co., Ltd., under powers of the Kensington and Notting Hill Electric Lighting Co.'s Act, 1899, £300,000.

Oxford Electric Co., Ltd. (34,685).—Return dated March 24th, 1926. Capital at date of return, £175,000 in 20,000 ordinary and 15,000 preference shares of £5 each. 20,000 ordinary and 11,000 preference shares taken up. £121,000 paid on 13,200 ordinary and 11,000 preference, and a further £1,550 paid on 310 ordinary shares forfeited. £34,000 considered as paid on 6,800 ordinary. Mortgages and charges, £110,000. On March 26th, 1926, it was resolved (*a*) to split each existing £5 share into five of £1, (*b*) to increase interest on the cumulative preference shares from 5 per cent. to 6 per cent. as from June 30th, 1926, and (*c*) to increase the capital to £250,000 by creating 75,000 new 6 per cent. cumulative preference shares of £1 each.

Burma Electric Supply Co., Ltd. (till recently known as " Burmah Electric Tramways and Lighting Co., Ltd.") (75,090).—Capital, £250,000 in 100,000 ordinary and 150,000 preference shares of £1 each. Return dated December 16th, 1925. 100,000 ordinary and 120,000 preference shares taken up. £100,000 paid on 100,000 preference. £120,000 considered as paid on 100,000 ordinary and 20,000 preference. Mortgages and charges, nil.

Bogota Telephone Co., Ltd. (69,059).—Capital, £150,000 in 125,000 preferred and 25,000 deferred shares of £1 each. Amended return dated December 11th, 1925 (filed April 28th, 1926). 125,000 preferred and 18,607 deferred shares taken up. £131,107 paid on 125,000 preferred and 6,107 deferred. £12,500 considered as paid on 12,500 deferred. Mortgages and charges, nil.

Consolidated Signal Co., Ltd. (71,141).—Capital, £425,000 in 220,000 preference and 205,000 ordinary shares of £1 each. Return dated February 25th, 1926. 214,195 preference and 150,548 ordinary shares taken up. £52,839 paid on 24,999 preference and 27,840 ordinary. £311,904 considered as paid on 189,196 preference and 122,708 ordinary. Mortgages and charges, nil.

Bray, Markham & Reiss, Ltd. (74,871).—Capital, £20,000 in £1 shares. Return dated December 1st, 1925. 17,080 shares taken up. £16,080 paid. £1,000 considered as paid. Mortgages and charges, nil.

Lancashire United Transport and Power Co., Ltd. (till recently known as " Lancashire United Tramways, Ltd.") (87,044).—Capital, £200,000 in £1 shares. Return dated March 9th, 1926. 192,878 shares taken up. £7 paid. £192,871 considered as paid. Mortgages and charges, £546,500.* Deferred debenture stock issued having no charge over the company's assets, £83,330. (*A further £40,000 of this stock has been deposited as security for possible advances.)

Mansfield and District Tramways, Ltd. (91,130).—Capital, £180,000 in 80,000 preference and 100,000 ordinary shares of £1 each. Return dated March 8th, 1926. 80,000 preference and 44,834 ordinary shares taken up. £80,609 paid on 62,767 preference and 17,842 ordinary. £44,225 considered as paid on 17,233 preference and 26,992 ordinary. Mortgages and charges, £67,611.

London Electric Wire Co. & Smiths, Ltd. (101,353).—Capital, £1,250,000 in 750,000 ordinary and 500,000 preference shares of £1 each. Return dated April 14th, 1926. 644,070 ordinary and 400,000 preference shares taken up. £350,035 paid on 35 ordinary and 350,000 preference. £694,035 considered as paid on 644,035 ordinary and 50,000 preference. Mortgages and charges, nil.

Mather & Platt, Ltd. (60,387).—Capital, £2,500,000 in 40,000 preference shares of £10 each and 2,100,000 ordinary shares of £1 each. Return dated March 12th, 1926. 40,000 preference and 1,363,660 ordinary shares taken up. £630,000 paid on 29,200 preference and 338,600 ordinary. £1,333,000 considered as paid on 10,800 preference and 1,025,000 ordinary. Mortgages and charges, nil.

Clarke, Chapman & Co., Ltd. (39,045).—Capital, £550,000 in 7,000 preference shares of £10 and 480,000 ordinary shares of £1. Return dated March 19th, 1926. 6,985 preference and 444,060 ordinary shares taken up. £100,210 paid, being £10 on 4,435 preference, £1 per share on 55,360 ordinary, and 5s. per share on 2,000 ordinary shares. £413,700 considered as paid, being £10 per share on 2,550 preference, £1 per share on 386,700 ordinary, and 15s. per share on 2,000 ordinary shares. Mortgages and charges, nil.

Hindhead and District Electric Light Co., Ltd.—Issue on May 20th, 1926, of £50 debentures, part of a series already registered.

Reading Electric Supply Co., Ltd. (35,651).—Capital, £152,300 in £1 shares. Return dated April 29th, 1926. 152,125 shares taken up. £147,775 paid. 4,350 considered as paid. Mortgages and charges, £98,400.

Newmarket Electric Light Co., Ltd. (44,450).—Capital, £30,000 in £10 shares. Return dated May 3rd, 1926. 2,656 shares taken up. £26,560 paid. Mortgages and charges, £14,200.

New Phonopore Telephone Co., Ltd. (44,654).—Capital, £10,000 in 9,000 ordinary and 1,000 founders' shares of £1 each. Return dated, December 23rd, 1925. 7,141 ordinary and 1,000 founders' shares taken up. £6,731 paid on 6,741 ordinary, leaving £10 in arrears. £1,400 considered as paid on 400 ordinary and 1,000 founders'. Mortgages and charges, £2,566.

Electric Sign Co., Ltd. (45,610).—Capital, £5,000 in £1 shares. Return dated April 28th, 1926. 2,000 shares taken up. £1,000 paid. £1,000 considered as paid. Mortgages and charges, nil.

City and General Radio Co., Ltd.—Debenture dated April 6th, 1926, to secure £500, charged on the company's property, present and future, including uncalled capital. Holder: F. Featherstone, 79, Cannon Street, E.C.4.

Harrow Electric Light and Power Co., Ltd. (44,529).—Capital, £50,000 in 6,667 ordinary and 3,333 preference shares of £5 each. Return dated March 4th, 1926. All shares taken up. £50,000 paid. Mortgages and charges, £25,000.

Power and Lighting Supplies Co., Ltd. (174,477).—Capital, £5,000 in £1 shares. Return dated February 11th, 1926. 2,125 shares taken up. £500 paid. £1,625 considered as paid. Mortgages and charges, nil.

Reason Manufacturing Co., Ltd. (64,701).—Capital, £52,500 in 200,000 preference and 10,000 ordinary shares of 5s. each. Return dated December 30th, 1925. 92,000 preference and 10,000 ordinary shares taken up. £2,349 paid on 9,397 preference shares. £23,150 considered as paid on 82,603 preference and 10,000 ordinary shares. Mortgages and charges, £13,000.

British Electric Transformer Co., Ltd. (76,351).—Capital, £1,000,000 in 300,000 preference and 700,000 ordinary shares of £1 each. Return dated April 8th, 1926. 300,000 preference and 325,000 ordinary shares taken up. £539,821 paid on 290,776 preference and 249,045 ordinary shares. £85,179 considered as paid on the remainder. Mortgages and charges, £20,000.

Costa Rica Electric Light and Traction Co., Ltd. (56,447).—Capital, £130,000 in £1 shares. Return dated April 14th, 1926. All shares taken up. £7 paid. £129,993 considered as paid. Mortgages and charges, £282,150.

Dixon & Corbitt and R. S. Newall & Co., Ltd. (24,228).—Capital, £160,000 in £1 shares. Return dated April 8th, 1926. All shares taken up. £96,150 paid. £63,850 considered as paid. Mortgages and charges, nil.

Newcastle and District Electric Lighting Co., Ltd. (28,022).—Capital, £300,000 in £1 shares. Return dated April 2nd, 1926. All shares taken up. £300,000 paid. Mortgages and charges, £317,500.

Thames Valley Electric Supply Co., Ltd. (185,597).—Capital, £100 in £1 shares. Return dated April 29th, 1926. All shares taken up. £100 paid. Mortgages and charges, nil.

Continental Automatic Telephone and Electric Co., Ltd. (184,764).—Capital £10,000 in £1 shares. Return dated December 31st, 1925 (filed March 9th, 1926). 1,302 shares taken up. £302 paid. £1,000 considered as paid. Mortgages and charges, nil.

Gayton Park Electricity Co., Ltd. (184,208).—Capital, £3,000 in £1 shares. Return dated March 15th, 1926. All shares taken up. £3,000 considered as paid. Mortgages and charges, nil.

Sennybridge Electric Supply Co., Ltd. (174,920).—Capital, £1,500 in £25 shares. Return dated June 30th, 1925 (filed May 18th, 1926). 48 shares taken up. £1,200 paid. Mortgages and charges, nil.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

Callender's Cable and Construction Co., Ltd.

The annual meeting was held on June 3rd, Sir J. Fortescue Flannery, Bart., M.Inst.C.E. (chairman of directors) presiding. After apologising for the delay in the holding of the meeting, due to the intervention of the General Strike, the chairman, in moving the adoption of the report and accounts (*vide* ELECTRICAL REVIEW, May 28th, p. 803), said that it was unnecessary to enlarge upon the General Strike, which was, happily, ended, but they had, unfortunately, still many troubles to overcome and much more work to do before the wheels of industry ran smoothly, but they were confident that that would, in due course, be accomplished. On the Tuesday morning following the declaration of the General Strike they were informed that their power would be cut off, and within an hour that took place. On endeavouring to start their afternoon shift they found all their plant and machinery dead, as the electrical energy had been deliberately cut off. It therefore became necessary to close the factory, and they were unsuccessful in endeavouring to obtain a supply until the following Tuesday, when a small supply was given them, which, however, on the termination of the strike, was immediately increased so as to meet their demands. Their workmen returned, and were given employment as far as possible. A large number of their men volunteered for various services, and in many cases the technical knowledge which they possessed was of great value to the community. Referring to the Electricity Bill, the chairman said that the uncertainty of the issue had had the effect of holding up the development of electrical enterprise in many directions. If the intentions of the promoters were realised and a substantial increase in the employment of electricity was rendered possible, it would undoubtedly mean an increase in the use of cables of all kinds. The directors were, however, of the opinion that the high expectations of immediate advantage which had been formed by the general public were greater than the future would justify. It seemed to be forgotten that in many of the large industrial areas of the country most of the objects of the Bill had already been fully attained by the power companies, and that in any event it would take some years before a substantial decrease in the cost of electricity to outlying areas and their consequent large development could take place. The method of linking up stations, and many other provisions of the Bill, were likely to be of great service to the community. In the meantime, however, the Bill had retarded progress. They hoped that progress would not be further hampered by the Bill being referred to committees to investigate all points. Regarding the report and accounts, the accounts submitted indicated a conspicuous advance. The company's prosperity was due very largely to the fact that it had always been in the forefront of the industry, by reason of new and improved machinery, the leadership of Sir T. O. Callender—supported by an excellent band of trained and willing workers—and the sound financial policy adopted. Keen competition existed, and although a very large business has been done, the profit on each individual item was relatively small. Large financial resources were necessary in order to carry on that ever-increasing business, and the nominal capital of the company was no guide whatever as to the sums which they had at their disposal and from which the profits and dividends resulted. It had sometimes been suggested that the company and some similar concerns were making unreasonably high profits, whereas that was far from being the case. The capital of the company had been increased by the creation of 200,000 ordinary shares, of which 100,000 were issued during the past year. Over 99 per cent. of that amount was subscribed by the shareholders direct in response to this invitation, and, of the remainder, somewhat less than 1,000 shares, applications for 86 times that amount were received from would-be subscribers. In making the allotments for those shares the directors gave special consideration to applications received from the employés. It was proposed to distribute by way of bonus £200,000 in fully paid-up ordinary shares to the present holders at the rate of one new share to every three now held. That would bring their book capital more in accord with the amount really employed in the business. To do that it would be necessary to increase the ordinary share capital, and the directors thought it desirable while doing so to take powers to make that issue larger than was at present required. The additional 200,000 was not to be offered for subscription at present, but it would be available when the increasing business and the fresh developments of the industry rendered it necessary to do so. The new shares would participate equally with the old shares in the final distribution of 10 per cent. The payments would be subject to income-tax at the rate of 3s. 11d. in the £. After adding the amount brought in from last year, there was a balance of £611,338, as against £462,664 brought in. As regarded the prospects for the current year, before the General Strike and present difficulties the directors had every reason to be satisfied with the outlook; but it was idle to deny that the convulsion which had shaken the industry of the country must have had its effect upon operations. Provided, however, that the troubles were cleared away in a satisfactory manner, the shareholders could expect with reasonable confidence the continuance of the same dividend even on the enlarged capital. The company had extended its operations in several parts of the world. The Okonite-Callender Cable Co. in the United States, whose works were now in regular operation, was producing cables of the same type as those which the company manufactured in England, for which there was a large demand in America. The Anchor Cable Co. had had a good year, the result of which had assisted the profits of the company. The outlook for the rubber wires which the Anchor Co. manufactured continued satisfactory.

Sir T. O. Callender, J.P., in seconding, supplemented the chairman's remarks on the strike, and expressed his appreciation of those men who had stood by the firm in the most loyal manner. They were looking forward to returning to the regular quantity of business at an early date. In the one or two instances where it had not yet been found possible to resume, they would do so as soon as complete transport facilities existed—which were, at present, wanting—and as soon as power was available to the fullest extent. The prospects for the year were, otherwise, excellent, and the company was looking forward to a large volume of business, especially in the higher grades of cables. As regards the company's operations abroad, these had been extended in a number of directions. India still remained their best customer, and in Bombay they had a well-run office with an adequately equipped staff. They had now started a new department in India, for the company had secured a contract for the overhead equipment for the electrification of some 24 miles of railway for the Bombay, Baroda and Central India line. That work was the beginning of some very large contracts in other parts of the country. The company had just finished the electrification of the Peninsula of Aden, and they had a large amount of work to do in the Malay Peninsula in connection with the Borneo Company, whilst in Khartoum and the Sudan they were working at full pressure on the important contract to which reference was made last year. Around the East Coast of Africa and various other parts of the world they were doing a large amount of work. In China they had had a very useful experience of what their men could do. During the period when Shanghai was suffering severely from strike fever and revolutionary ideas, the company laid through the main streets of that city a complete set of underground cables for the Tramway Company without any casualty whatever. Even Zanzibar was

buying a considerable quantity of material from them, and from Sydney, New South Wales, they had just secured one of the largest contracts for "super-tension" cable ever placed in this country or elsewhere. The Okonite-Callender Co. was now enjoying the benefit of the parent company's long experience, and had had the assistance of some of their best men, with the result that it had now one of the finest businesses on the Western side of the Atlantic.

The report and accounts were adopted, and at a subsequent extraordinary meeting the increase in the company's capital was approved.

Brush Electrical Engineering Co., Ltd.

The report for the year ended December 31st last states that the balance remaining at the credit of the profit and loss account in the preceding year (£76,190) has been carried to an undivided profits account, and does not, therefore, appear in the report. After providing for general charges, maintenance, debenture interest, &c., the net profit for the past year is £62,197. From this amount it is proposed to transfer £5,544 to general reserve; to pay a dividend of 10 per cent.; and to pay a further 4 per cent. interest on the prior lien second debenture stock; leaving £8,751 to be placed to the credit of a proposed co-partnership scheme suspense account. It is stated that consultations have taken place with the staff and workpeople, the trade unions concerned, and the Engineering Employers' Federation. A definite co-partnership scheme has not yet been formulated, but discussions are still proceeding, and there is a prospect of a satisfactory result. A tentative scheme has been drawn up and submitted to the shareholders for their provisional approval. The general reserve now amounts to £233,633. The sum of £3,180 was spent on capital account during the year. It is stated that during the year there was an improved demand for Brush-Ljungström turbo-generators and other engineering plant manufactured by the company, and important installations were carried out at home and abroad. The rolling stock department has been kept busy in the manufacture of electric tramcars and motor omnibuses, and the current year's prospects for further contracts are satisfactory. Meeting: June 14th.

Shanghai Electric Construction Co., Ltd.

The annual meeting was held on June 2nd Mr. L. W. Hawkins, presiding in the absence of the chairman (Mr. J. S. Haskell), said that the year under review had been one of anxiety and difficulty owing to the serious disturbances in Shanghai. Not only had the company's revenue been affected, but development was retarded postponing a return upon the new capital which had been raised in the preceding year. The fact that the board had been able to declare a dividend of 10 per cent. on the increased capital was testimony to the company's stability and vitality. The continuous growth of the business, coupled with the permanently increased cost of labour and materials, would render inevitable in the future larger appropriations for renewals than had been made in the past. The company had 37 trolley omnibuses in service which were producing satisfactory results; the board's experience pointed to the desirability of opening new routes gradually. It was expected that 60 new 'buses would be in service by the end of the current year, and the board believed that as the traffic developed it would be expedient to increase the number from time to time. In conclusion Mr. Hawkins referred to the bugbear of depreciation of the subsidiary coinage with which the company was always burdened. The report and accounts were adopted.

Ever-Ready Co. (Great Britain), Ltd.

Mr. C. H. C. Moller presided at the annual meeting on June 1st, and in presenting the report and accounts (*vide* ELEC. REV., May 14th and 21st, p. 774), said that the past year had been a record one, the increase extending to every department of the company's activities. Furthermore, in spite of the general strike, the figures for April and May showed a considerable increase over those of the corresponding period of 1925. The directors felt that they should be in a position to issue further capital in case of need and resolutions providing for that were to be submitted. In the event of future issues the present shareholders, as on previous occasions, would be given the first opportunity to increase their holdings. The chairman mentioned that £30,000 had been invested in War Loan and that the number of shareholders now exceeded 1,500. After the ordinary meeting special meetings were held at which resolutions approving the creation of 250,000 ordinary shares of £1 were passed. This raises the nominal capital of the company to £750,000.

Dubilier Condenser Co. (1925), Ltd.

Speaking at the annual meeting on June 1st, the chairman (Sir Arthur Dickinson) said that the board as at present constituted had taken over the affairs of the company in June last year, and, unfortunately, had had to contend with an entirely unexpected depression in the radio industry. In the case of the company the effects of the depression were aggravated by the fact that it had recently moved into new premises at North Acton and this necessarily added to the overhead expenses. It was the company's policy to keep abreast, or ahead if possible, of all developments and improvements in the radio industry and other lines emerging from it; such developments on sound and conservative lines were the life-blood of a concern like theirs. While the results of trading must be considered disappointing, they were perhaps better than might have been expected in the circumstances. Mr. W. H. Goodman (managing director) spoke of the company's activities and made particular mention of the installation of mica condensers at the Rugby radio station, which, he said, were the largest ever made. The report and accounts were adopted.

United River Plate Telephone Co., Ltd.

The directors' report for the past year states that the revenue was £2,023,002 and the expenses were £1,618,858, leaving a balance of £404,144. After deducting debenture interest and preference and interim ordinary dividends there remains £266,644, which it is proposed to distribute as follows:—Final dividend of 5 per cent. on the old ordinary shares (making 8 per cent., free of tax); a dividend of 5s. per share on the last issue of ordinary shares, free of tax; leaving £38,644 to be added to the amount brought forward and carried to the current year's accounts. The progress of the company is satisfactory, although delays in the delivery of plant have retarded the rate of connecting up subscribers. Sufficient equipment is in course of manufacture to enable the company to meet the demands of the public. Further capital will be needed and it is proposed to create 200,000 shares of £5 each, raising the nominal capital to £6,000,000; it is not intended to make an immediate issue. The meeting was held on Tuesday last.

Electric Construction Co., Ltd.

This company's report for the year ended March 31st last records a net profit of £37,250, to which is added £21,411 brought forward, making £58,931. Interim dividends absorbed £11,197, and it is proposed to allocate the balance (£47,734) as follows:—Final dividend on the 7 per cent. preference shares, £2,197; final dividend at the rate of 9 per cent. on the ordinary shares, making 7½ per cent. for the year, and a bonus of 2½ per cent., £21,000; £3,000 to staff superannuation fund; leaving £21,537 to be carried forward. The report says that the general depression in trade reacted on the electrical manufacturing industry, and severe competition continued to prevail. Export business showed some contraction, but in the circumstances the directors consider the results satisfactory. The death of Sir Henry Mance is recorded, as is the appointment of Mr. W. M. Furniss, manager of the Wolverhampton works, to the board. The meeting was to be held yesterday (Thursday).

French Companies.

The *Compagnie Continentale Edison* proposes to pay a dividend of 37.50 fr. per share out of net profits of 1,626,000 fr. for 1925, as compared with 35 fr. in the previous year.

The accounts of the *Compagnie Française Thomson-Houston* show, after provision for depreciation, net profits amounting to 11,754,000 fr. for 1925, as compared with 14,940,000 fr. in the previous year.

The *Société Petrier, Tissot and Raybaud*, Lyons, maker of electrical apparatus, records net profits of 526,000 fr. for 1925, as compared with 675,000 fr. in the preceding year; it is proposed to maintain the dividend at 15 fr. per share.

The *Société des Appareils Electriques et Compteurs Garnier*, Lyons, reports net profits of 402,000 fr. for 1925, as against 390,000 fr. in 1924, permitting of the payment of a dividend at the rate of 75 fr. per share, as against 65 fr. in 1924.

The *Compagnie Générale de Télégraphie sans Fil* records net profits of 7,308,000 fr. for 1925, as compared with 7,250,000 fr. in 1924; the dividend is again at the rate of 45 fr. per share.

The *Société d'Electro-Chimie, d'Electro-Métallurgie et des Aciéries Electriques d'Ugine* reports a net profit of about 9,000,000 fr. as compared with 8,000,000 fr. in 1924. The dividend is at the gross rate of 45 fr. per share as against 40 fr.

The *Société des Magnetos* states that the turnover in 1925 appreciably increased and this development has induced the directors to proceed with an extension of the works constructed two years ago. The net profits at 2,912,000 fr. are greater than in the previous year and the dividend is 26 fr. per share.

German Companies.

The directors of the *Felten and Guilleaume Company*, Cologne-Mulheim, recommend a dividend of 6 per cent. for 1925, as in the previous year.

The *Saxony Works, Light and Power Company*, Dresden-Niedersedlitz, reports a turnover of 24,000,000 marks in 1925, being a large increase over the previous year. After writing off 685,000 marks for depreciation, it is proposed to pay a dividend of 6 per cent. and carry 54,000 marks forward.

The *Land and Sea Cable Works Company*, Cologne-Nippes, states that the works were busy in the first half of 1925, but in the second half the orders received considerably declined, and this condition has continued this year. The net profit was 337,000 marks, as compared with 315,000 marks in 1924, the dividend remaining at 10 per cent.

Swiss Company.—The *Alioth Electricity Company*, Basle, which has become a holding company and is in close relations with Brown, Boveri and Co., Baden, records net profits of 346,000 fr. for 1925, and a dividend at the rate of 5 per cent. on the share capital of 6,000,000 fr.

Clayton & Shuttleworth, Ltd.—The accounts for 1925 show a further loss of £13,071; the preceding year's deficit was £106,203, making a total of £119,274 for the two years, which is slightly reduced by the credit balance from 1923 (£2,196). The company's liability to the Government has

been reduced from £73,295 to £47,500, and £30,000 is to be paid in the current year, necessitating fresh arrangements with the company's bankers. The directors propose a reorganisation of capital. The works and plant have been valued at £208,586, or within £19,000 of the book value, which is considered satisfactory. The sum at the credit of the suspense account includes the concession made by the Government, and the total of that account, £75,749, will be available for depreciation and to set against the debit balance. Meeting: June 15th.

British Electric Traction Co., Ltd.—The directors report that the gross profit for the year ended March 31st last amounted to £300,544, as against £286,587 in 1924-25. After deducting general expenses and loan and debenture interest there remains £171,538, which the directors recommend should be dealt with as follows:—Dividend of 6 per cent. (3 per cent. already paid) on the cumulative participating preference stock; dividend of 8 per cent. (3 per cent. paid) on the ordinary stock; and £22,493 to undivided profits account, making that account £294,490. The amount standing to the credit of the reserve account is £520,000. The average revenue from investments rose from 5.52 to 5.91 per cent. Sir E. C. K. Ollivant has resigned from the board and Viscount St. Davids has been appointed a director. Meeting to-day (Friday).

Madras Electric Supply Corporation, Ltd.—The net profit for 1925 was £45,386, an increase of £12,407, and to this is added £6,185 brought forward, making £51,571. It is proposed to pay a final dividend of 5½ per cent., free of tax, again making 8 per cent., tax free, for the year; to transfer £10,000 to general reserve; and to carry forward £5,550. The rate of increase of sales was retarded by the closing down of two bulk supply consumers, but otherwise progress was satisfactory. The tramways showed a balance of £21,515 (against £24,124 in 1924), after providing for debenture interest, &c. A dividend of 6 per cent., free of tax, has been declared on the ordinary shares and a balance of £7,515 is carried forward. Meeting: June 16th.

Eastern Extension, Australasia and China Telegraph Co., Ltd.—The gross revenue for the year ended December 31st last amounted to £1,953,927, and the balance, after deducting £691,003 for ordinary expenses and £256,514 for maintenance, &c., to £1,006,410. After meeting taxation and debenture interest and adding £409,141 brought forward, there remains £1,263,435, from which £450,000 has been transferred to the general reserve. The dividends, totalling 10 per cent., free of tax, for the year, absorb £400,000, leaving £413,435 to be carried forward. The duplication of the Cocos-Fremantle section was successfully completed in March last. The meeting was held yesterday (Thursday).

Cawnpore Electric Supply Corporation, Ltd.—The directors report a surplus of £58,874 for 1925. The deduction of debenture interest left £45,743, to which was added £1,248 brought forward, making £46,991. After transferring £10,000 to depreciation and renewals reserve and £3,000 to general reserve, writing off £2,560 from share issue expenses, &c., and paying the preference and interim ordinary dividends, there remained £15,460. A final dividend of 7 per cent. on the ordinary shares (making 10 per cent.) and directors' commission, absorb £11,760, and £3,700 is carried forward. The meeting was held on Tuesday last.

Prospectus.—*Lancashire United Transport & Power Co., Ltd.*—This company, formerly known as the Lancashire United Tramways, Ltd., has this week invited subscriptions to an issue of £250,000 six per cent. first mortgage debenture stock at 93 per cent., principally to provide the money required to redeem the outstanding balance of £202,671 prior lien debenture stock. The list is to close to-day (Friday) or earlier.

Submarine Cables Trust.—Sir John Denison-Pender, G.B.E., presided at the annual meeting last week, and in presenting the report stated that the profit for the past year had been sufficient to cover the 6 per cent. interest, free of tax, to the certificate holders, and to enable them to redeem 210 certificates, leaving 330 outstanding. After the next drawing of certificates, probably in May, 1927, the trustees hoped to be able to take the necessary steps to terminate the trust which was started in 1871. During its existence the value of its holdings had doubled.

Stock Exchange Notices.—Application has been made to the Committee to allow the following to be officially quoted:—

Newcastle-upon-Tyne Electric Supply Co.—550,000 ordinary shares of £1 each, fully paid, Nos. 1,762,682 to 2,312,681.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

Electrical Finance and Securities Co., Ltd.—76,162 shares of £1 each, fully paid, Nos. 1 to 76,162.

Madras Electric Supply Corporation, Ltd.—23,600 5½ per cent. (free of income tax) cumulative preference shares of £1 each, fully paid, Nos. 303,201 to 326,800.

Colombo Electric Tramways and Lighting Co., Ltd.—The accounts for the year ended December 31st last show a net profit of £108,416. After providing for debenture interest, &c., and adding the balance brought forward, the amount available is £128,591. From this £39,933 is transferred to general reserve and renewal fund, which after certain writing-off amounts to £250,000. A dividend of 15 per cent., free of tax, is recommended; this will leave £69,029 to be carried forward.

Iron Trades Employers' Insurance Association, Ltd.—The premium income for 1925 was £543,447, and sundry additions, including the balance brought forward, give total receipts of £672,552. Of this £468,855 has been set aside for compensation and incidental expenses and £64,806 for management expenses, &c. A return at the rate of 20 per cent. of the workmen's compensation premium for 1925 is recommended. Sir J. E. Thornycroft, K.B.E., has taken the place of Sir John Dewrance, K.B.E., on the board, and the appointment of Mr. F. J. West as a director is recommended.

China and Japan Telephone and Electric Co., Ltd.—The accounts for 1925 show a net profit of £18,639; to this is added £8,162 brought forward, making £26,801. It is proposed to transfer £10,000 to reserve, to pay a dividend of 20 per cent. and a bonus of 10 per cent., both free of tax, and to carry forward £4,873. The sale of the company's undertaking in the Hong Kong area to the Hong Kong Telephone Co. was completed in July, 1925. The Hong Kong Co. has declared a dividend for the six months at the rate of 8 per cent. per annum. The meeting was to be held yesterday (Thursday).

Ruston & Hornsby, Ltd.—The accounts for the year ended March 31st last show a credit balance of £152,551, and an available sum of £80,170, after deducting depreciation and debenture interest. The addition of £69,887 brought forward gives £150,057. From this are deducted preference dividends paid to December 31st, 1924, and it is proposed to pay one year's dividend on the two classes of preference shares, and a dividend of 2½ per cent. on the ordinary shares, leaving £28,307 to be carried forward.

J. G. White & Co., Ltd.—This company, which operates through subsidiary concerns, records a net profit of £8,156 for the year to February last. Out of this £7,367 is written off in respect of investments, leaving £789, which is placed against a debit balance of £244,789 brought forward, reducing it to £244,000. The debit balance is due to the writing-off of advances to two subsidiary companies. The directors are considering a scheme for the reorganisation of the company's capital and hope to put proposals forward at the annual meeting on June 14th.

West African Telegraph Co., Ltd.—The net revenue for the past year was £14,318, and after providing for income tax and adding £2,030 brought forward there remains £13,374. The directors propose to transfer £3,000 to general reserve, to pay a dividend of 4 per cent., free of tax (as in 1924), and to carry forward £1,131.

Havana Electric Railway, Light and Power Co.—The gross earnings for 1925 amounted to $15,309,372 and the net earnings to $7,242,060. Dividends of 6 per cent. have been paid on the preferred and common stock and $5,059,845 is carried forward.

Stanton Ironworks Co., Ltd.—The directors recommend a final dividend of 6 per cent., free of tax, on the ordinary shares, making 10 per cent., free of tax, for the fifth year in succession.

New Issue.—*Ericsson Telephones, Ltd.*—The recent issue of 99,960 seven per cent. cumulative preference shares at £1 each was considerably over-subscribed. Letters of allotment and regret in respect of the issue were posted on Monday.

Anderston Foundry Co., Ltd.—Out of a profit of £13,076 the directors propose to pay a dividend of 7s. 6d. per share, as compared with 9s. in 1924-25.

Pennsylvania Water and Power Co.—A dividend of $2 per common share has been declared in respect of the quarter ending June 30th.

British Thomson-Houston Co., Ltd.—The directors propose to pay (on July 1st) a dividend in respect of the half-year to June 15th on the 7 per cent. cumulative preference shares.

Canadian General Electric Co., Ltd.—A dividend of 1¾ per cent. has been declared on the preference stock in respect of the quarter ending June 30th.

Guest, Keen & Nettlefolds, Ltd.—A final dividend of 1s. per ordinary share has been declared, making 10 per cent., free of tax, for the year 1925-26, as in the preceding year.

Quebec Power Co.—Dividends of $1¼ per common share and $1¾ per preferred share have been declared in respect of the quarter ending June 30th.

Stocks and Shares.

MONDAY EVENING.

STOCK Exchange markets are developing upon firm and satisfactory lines. Satisfactory, that is to say, to the present holders of stocks and shares, who view with pleasure the way in which prices steadily advance week by week. There can be no doubt that the reason for the increase of business and of confidence that has come to the markets is due to the collapse of the General Strike, and to the greater feeling of security now felt by the capitalist, large and small. It seems practically certain that for some time past there has been at the back of people's minds an uncomfortable fear of what a General Strike might mean if it should be called. The worst has happened, and the General Strike has shown itself to be

a failure from the principal point of view of holding up the nation and strangling industry.

Relieved of the apprehension, money is going into all sorts of securities, more particularly those of the best-class order. The lists of stocks and shares which are printed here, testify to the favour in which sound Industrials are held by the public. Cable stocks are uniformly harder. There has been a good deal of inquiry for electricity supply shares, though the changes in prices hardly reflect this. In the group of manufacturing and construction shares, the feature is the maintenance of the remarkable advances that have occurred during the past four weeks. New issues are commanding a very general degree of success. It is only necessary for good stock to be offered at a reasonable price for it to be eagerly taken, and for the subscription lists to close very promptly.

The Submarine Cables Trust is coming to an end in the near future and Sir John Denison-Pender, at the company's meeting the other day, mentioned that the market value of the various holdings shows an appreciation of nearly 100 per cent. over the original cost price. Holders have done very well during the fifty-five years of the Trust's existence, and they are likely to receive a handsome bonus at the final redemption of the certificates.

Home Railway stocks are inclined to be dull, as is natural, though the falls are slight and insignificant. The Southern Railway's ambitious suburban electrification scheme, which, it will be remembered, ran into eight million pounds, has now reached its final stage. Underground Electric ordinary shares are 5s. down and the shilling issue, at 10s. 6d., have lost 1s. Districts weakened to 52½. Central London Assented stocks are scarce.

South London Electric Supply are a harder market at 2½. London Electric preference show a modest gain. County of London have parted with some of their recent strength: Bournemouth and Poole are also easier. There is a fair line of Electric Supply Corporation 6 per cent. preference shares on offer at 21s. 3d., with January and July dividends. The yield comes to £5 13s. per cent. on the money. Several thousand English Electric 6 per cent. preference can be obtained at 19s. 3d., to pay 6¼ per cent. on the investment. Dividends in this case are in April and October. British Automobile Traction 8 per cent. preference are available at 25s. 6d. These rank for a further 2 per cent. after the ordinary have received 8 per cent. The preference are in regular receipt of this extra 2 per cent., and, allowing for this, a buyer gets 7¼ per cent., dividends in February and August.

Rises amongst cable stocks have lifted the prices of Anglo-American preferred and deferred, and all the ordinary stocks and shares in the Eastern list. Following upon the excellent Eastern Telegraph report, the "China" Company issues a statement in which, although the net profit is a trifle less than that of a year ago, the shareholder cannot fail to find satisfaction. The West African Telegraph Company repeats its 4 per cent. tax-free dividend. Marconis have strengthened to 25s., and Marconi Marines are 2s. 6d. up, at 21s. 3d., in sympathy partly with the advancing parent shares—partly on account of the better feeling that characterises the market for shipping shares.

British Electric Tractions are again higher, at 133½, at which the yield on the money is modest at 6 per cent. Foreign traction varieties are steady. The healthier tendency of Mexicans continues to be noticeable. Brazilian Tractions just manage to keep in three figures. Anglo-Argentine Tramways first preference are changing hands in fair quantities around 62s. 6d., the speculative investor being attracted by the yield of 8¾ per cent. on the money. Colombo Electric Tramways declares a dividend of 15 per cent. tax-free on the ordinary shares.

If the manufacturing shares do not exhibit any special advances, the market in them is, nevertheless, so hard as to provoke a jobber to complain that prices are too good. This is a market lament at quotations having reached a level which renders new buyers cautious, though the companies are doing well enough to preclude any desire to sell on the part of holders. British Insulated, Callenders and India Rubber shares are better. General Electrics and Siemens have drooped. At the recent meeting of the Siemens Company, the chairman spoke with hopefulness of the outlook, provided that operations continue as at present, without interruption. On the same day, the British Thomson-Houston chairman referred to a lowering in the margin in his company's profit, owing to the keenness of competition. British Thomson-Houston 7 per cent. preference stand at 23s. 6d. and the 7 per cent. mortgage debenture stock (redeemable) at 105½.

Babcock & Wilcox attract a good deal of business around 52s. Other shares in the iron and steel market are dull, owing to the coal position and the effect of the Armstrong report. The rubber share department is stagnant, business having fallen into humdrum and uninteresting lines by reason of the quietude of the market in the raw material.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom. £	Dividend. 1924	Dividend. 1925.	Price June 7 1926.	Rise or fall.	Yield. p.c.
Bournemouth and Poole	1	14	14	36/-	—1/-	5 0 0
Brompton Ordinary	1	10	10	31/9	—	*6 6 1
Charing Cross Ordinary	1	15	15	45/9	—	6 10 10
do. do. 4½ Pref. ...	1	4½	4½	17/-	—	5 5 11
Chelsea	1	12	12	2	—	6 0 0
City of London	1	15	15	47/-	—	6 7 8
do. do. 6% Pref.	1	6	6	22/-	—	5 9 1
Clyde Valley	1	8	8	27/-	—	5 18 6
County of London	1	15		56/3	—1/8	5 12 8
do. do. 6 % Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	7	7	23/6	—	5 19 2
do. 7% Pref.	1		7	22/6	—	6 4 8
Elec. Supply Corporation	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	15	15	13½	—	5 11 1
Lancs. Light and Power	1	7½	7½	24/6	—	6 2 5
London Electric	1	10	10	32/6	—	6 3 1
do. do. 6% Pref.	5	6	6	5 1/8	+1/8	5 16 8
Metropolitan	1	11	11	37/-	—	5 18 11
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	20/6	—	5 17 1
Newcastle-on-Tyne Ordinary ...	1	7	7	22/-	—	6 7 3
do. 5% Pref. ...	1	5	5	18/-	—	5 11 1
do. 7% Pref. ...	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref. ...	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.... ...	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	16½	—	5 8 6
South London...	1	15	15	2½	+⅛	6 0 0
South Metropolitan Pref.	1	7	7	25/6	—	5 9 10
Urban Ordinary	1	4	7	1 1/8	—	6 11 9
do. 6% Pref.	1	6	6	1	—	6 0 0
Westminster Ordinary	1	15	15	44/6	—	6 16 0
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	19/6	—	7 13 10
Yorkshire Elec.	1	8	8	27/-	—	5 18 6

Home Rails.

Central London Ord. Assented ...	Stock	4	4	69	—	5 15 11
Metropolitan	,,	5	5	65½	—	7 13 8
do. District	,,	3½	3½	52½	—½	6 13 4
Underground Electric Ordinary ...	10	Nil	Nil	3½	—¼	Nil
do. do. "A" ...	1/-	Nil	Nil	10/6	—1/-	Nil
do. do. Income ...	Bonds	6	6	100	—	*6 0 0

Telegraphs and Telephones.

		Dividend. 1924	Dividend. 1925.			
Anglo-Am. Tel. Pref.	Stock	6	6	104	+2	5 15
do. Def.	,,	1½	1½	24	+½	6 5 0
Automatic Telephone	1	3	6	2½	—	4 0 0
Chili Telephone	5	6	5	6½	—	*3 12 9
Cuba Sub. Ord.	10	5	5	7	+½	7 2 10
Eastern Extension	10	10	10	17½	+⅛	*5 11 11
Eastern Tel. Ord.	Stock	10	10	177½	+2	*5 12 8
Globe Tel. and T. Ord.	10	10	10	17⅝	+⅛	*5 11 11
do. do. Pref.	10	6	6	10⅝	+⅛	5 10 4
Great Northern Tel.	10	22	20	28	—	7 2 10
Indo-European	25	8½	10	45½	—	*5 10 0
Marconi...	1	10	10	1½	+1/16	8 0 0
Marconi Marine	1	10	7½	21/3	+⅛	7 1 2
Oriental Telephone Ord.	1	12	12	43/9	—	*5 9 7
United R. Plate Tel....	5	8	8	8 1/16	+⅛	*4 19 3 8
Western Telegraph	10	10	10	17½	+½	*5 14 8

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	8⅜	—	5 16 0
do. do. 2nd Pref. ...	5	8	8	2½	—	10 18 2
do. do. 5% Deb. ...	Stock	5	5	71½	—	6 19 10
British Electric Traction Ord. ...	,,	7	8	133½	+1	6 0 0
do. do. 6% Pref. ...	,,	6	6	111	—	5 8 1
Brazil Traction	100	4	5	100	—	5 0 0
Brit. Columbia Elec. Rly. Pcs. ...	Stock	5	5	86½	—	5 17 0
do. do. Preferred ...	,,	96/-	126/9	109½	—	*5 16 0
do. do. Deferred ...	,,	120/5	8	181	—	*6 2 2
do. do. Deb. ...	,,	4½	4½	76	+1	5 11 10
London & Sub. Trac. 5% Pref. ...	1	2½	Nil	6/-	—	Nil
London United Tram. Deb. ...	Stock	4	4	49	—	8 3 4
Mexico Trams 5% Bonds	—	5	5	65½	—	7 12 6
Mexican Light Common	100	Nil	Nil	33½	+1	Nil
do. Pref.	100	Nil	Nil	73½	—	Nil
do. 1st Bonds	—	5	5	71½	—	6 19 10
Yorkshire (West Riding)	1	5	—	14/-	—	7 2 10

Manufacturing Companies.

Babcock & Wilcox	1	12	12	52/-	—	*5 0 0
British Aluminium Ord.	1	5	10	2½	—	5 0 0
British Elec. Transformer Pref. ...	1	Nil	7	18/9	—	7 9 4
British Insulated Ord.	1	15	15	3½	+1/16	4 18 4
Brush Ord.	1	10	10	37/-	—	7 5 6
Callenders	1	15	15	4½	+⅛	3 12 9
do. 6½% Pref....	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	15/-	—	... ...
Edison-Swan	4/-	10	10	8/3	—	4 17 0
do. 5% Deb.	Stock	5	5	88	—	6 0 6
Electric Construction	1	10	10	32/6	—	6 3 0
Enfield Cable, Pref.	1	7½	7½	1½	—	6 0 0
English Electric	1	5	Nil	16/3	—	... ...
do. do. Pref.	1	6	6	19/-	—	6 6 4
Gen. Elec. Pref.	1	6½	6½	23/-	—	5 13 1
,, Ord.	1	5	7½	29/9	—1/-	5 0 10
Hanley	1	16	20	4	—	5 0 0
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber...	1	5	5	23/-	+6d.	*4 6 11
Johnson & Phillips	1	10	17½	3½	—	5 15 8
Met.-Vickers Ord.	1	8	8	25/-	—	6 8 0
do. Pref.	2	8	8	3⅜	—	6 14 9
Siemens Ord.	1	7½	7½	1½	—1/16	5 0 0
Telegraph Construction	12	20	10	27½	—	*4 7 8

*Dividends paid free of Income Tax.

Windmill Electricity Generators.

(*Summary of a Report by the* INSTITUTE OF AGRICULTURAL ENGINEERING, UNIVERSITY OF OXFORD.)

HITHERTO no attempt has been made in this country to investigate systematically the various details of design for the generation of electricity by wind-power, or to offer means whereby manufacturers might obtain authoritative figures bearing on the general problem, or on their designs. Accordingly, the investigations originally undertaken by the research branch of the Ministry of Agriculture and carried out at the Harpenden windmill experimental station of the Institute of Agricultural Engineering* should serve as a contribution to the solution of the problem.

Apart from the purely technical side of the subject, there is the equally important economic side; users of other forms of motive power have reliable figures at their command on which to base their forecasts as to the cost of their generated electricity, but users of windmills are quite in the dark in this respect. In spite of the makers' endeavours to give reliable figures, a windmill is generally installed on a hit-or-miss principle, and there is no doubt that the consequent paucity of reliable data is the main cause of many prospective users deciding to reject this form of power.

Similar vagueness exists with regard to the amount of available winds throughout the year, the critical periods of calm, &c. It is hoped by the collection of data on wind conditions to put all these factors on a more certain footing, so that it will be possible to plan a windmill generating installation with the same security as that which already applies to any other system.

Wind-speed fluctuates with marked rapidity, the range being two or three m.p.h. in low winds and as much as 20 or 30 m.p.h. in high winds. Another fact which the tests established is that the wind-speed is never coincidently the same at two different points, and also becomes greater as the height above ground is increased. If the blade were of the correct stream-line shape, not only would there be no detraction from the pressure on the front of the blade, but there would be a suction effect on the back which would help the front pressure. It is thus seen how important it is to have stream-lined blades, in order to obtain greater outputs from a given-sized wheel. A further consideration must, however, be made; the formation of any eddies, even for quite a distance behind the blade, is fatal to stream-line flow, and any structure behind the wheel is bound to lead to the formation of eddies. Less harm is done by a structure in front of the wheel, and in all mills where completely stream-lined blades are used, the wheel is placed behind the structure, which has the additional advantage of not requiring any direction control, since the wind-pressure on the wheel is behind the pivoting centre, and the wheel is kept in a position facing the wind-stream. It might be thought that, tending as they do to higher efficiency, stream-lined blades would be employed exclusively, but as there is no fuel cost and attention is entirely directed to cutting down first costs and maintenance charges, most manufacturers will remain conservative until stream-lined blades can be more easily and conveniently produced.

One essential component of a windmill generating plant is the storage battery, and while attempts have been made to dispense with this costly item, there is little doubt that any system of windmill generation must include a battery to obtain satisfactory working. An efficient cut-in should operate with a minimum rise of the generator voltage over that of the battery voltage, say, two volts, and should cut out when, and not before, the charging current has reached zero, thus preventing flashing. Usually small sets of, say, ½ kW, have a generator designed to give a constant efficiency of about 60 per cent. over the whole load range; for larger sets a generator is usually employed with an efficiency up to 80 or 90 per cent. at full load; at light loads the efficiency of such a generator will be low, about 30 or 40 per cent. For the voltage range to be as small as possible the field system in smaller sets is usually designed to work on the top part of the magnetisation curve, giving early saturation of the field; in larger sets compounding is introduced, while in still larger sets up to 10 kW, where the greater size justifies more supervision, field-regulating resistances may be fitted. One particular set includes a pressure regulator which keeps the voltage absolutely constant, but the losses in this device are so great that the method is being abandoned.

Seven sets of plant have been tried, representing five makes, as follows:—

No. 1 *Airolite* (Telford, Grier and Mackay, Ltd.). Wheel diameter 14 ft., 18 single concave blades; 1.5-kW, 120-volt, bevel-geared generator.

No. 1a. Same as above, with new wheel, 12 ft. 6 in. diameter, with 12 outer and 18 inner blades.

No. 2 *Garty-Apex* (Glasgow Electrical Engineering Co., Ltd.) Wheel diameter 8 ft., 15 single concave blades; 400-watt, 50-volt, spur-geared generator.

No 2a. Same as above, with new wheel.

No. 3. Similar to No. 2.

No. 4 *Ventimotor* (Patent Lighting Co., Ltd.) Wheel diameter 8 ft. 6 in., 4 semi-stream-lined blades; 250-watt, 50-volt, double-reduction, chain-driven generator.

No. 5 *Aerodynamo* (Aerodynamos, Ltd.) Wheel diameter 29 ft. 5 in., 4 stream-lined blades; 10-kW, 220-volt, double-reduction (2 sets internal), spur-geared generator.

No. 6 *Agricco* (Young, Osmond & Young, Ltd.) Wheel diameter 22 ft., 5 semi-stream-lined hollow blades; 5-kW, 150-volt, double-bevel, spur-geared generator.

No. 7. Similar to No. 4.

The results of the investigations are divided into (a) economic, showing the cost per kWh supplied by each plant over a period of one year; (b) technical, with curves showing the power developed at each wind-speed, and subsidiary curves derived from these; and (c) meterorological, with tables showing the wind conditions throughout the year. The financial charges incurred during the year include interest and depreciation based on the capital cost of the plant and battery, and maintenance; the total output of the generator cannot, for the purposes of these calculations, be accepted as the net available output, since there is necessarily a loss in storage due to the inefficiency of the battery. The figures given as to the cost per kWh produced only hold good provided that the utmost use is made of all the available power. In most cases, however, the plant is larger than is necessary for its load, and as there will be long periods of high winds during which the battery is being overcharged, with consequent waste, a higher charge will be thrown on the units which are actually consumed.

The only true basis of wheel efficiency is that of output/cost and not output/input as is usual. The disk area basis of calculation gives the multi-bladed wheels the highest position, whereas on the blade-area basis the highest points are taken by four- and five-bladed wheels. One four-bladed wheel (No. 5, "Aerodynamo") stands out clearly above the others, even at low wind-speeds, and this margin is so great that it enables the cost per sq. ft. of constructing these blades to be much higher than that of the next best, and yet to maintain the highest efficiency on the output/cost basis. The next highest type on the blade-area basis is No. 6 "Agricco," but it is closely followed (and surpassed at low wind-speeds) by No. 2a "Garty-Apex" with improved wheel (outer trailing-edge of each blade rounded off). No. 7, identical in design to No. 4, is superior to No. 6 and No. 2a at higher wind-speeds, but it is inferior to them at low speeds. No. 1a is fitted with a new "high-efficiency" wheel. No. 1 (the old wheel) and No. 2 (the old "Garty-Apex" wheel, identical with No. 3) are approximately the same. The larger sets (Nos. 1, 5 and 6) have an additional advantage at higher wind-speeds inasmuch as they have a higher generator efficiency than is practicable with the smaller sets, but in the case of Nos. 5 and 6 the results given are not necessarily accepted as final.

The following figures represent the cost per kWh of electricity produced by each mill:—

No. 1.	Capital outlay	£343 0 0
	Annual charges	£48 8 11
	Total output per year	1,370 kWh
	Available output per year	1,028 kWh
	Cost per kWh	11.3d.
No. 1A.	Total output per year	1,780 kWh
	Available output per year	1,336 kWh
	Cost per kWh	8.7d.
No. 2.	Capital outlay	£130 0 0
	Annual charges	£18 2 8
	Total output per year	608 kWh
	Available output per year	456 kWh
	Cost per kWh	9.5d.
No. 2A.	Total output per year	912 kWh
	Available output per year	684 kWh
	Cost per kWh	6.4d.
No. 3.	Capital outlay	£118 0 0
	Annual charges	£16 13 6
	Total output per year	421 kWh
	Available output per year	316 kWh
	Cost per kWh	12.7d.
No. 4.	Capital outlay	£120 0 0
	Annual charges	£15 15 8
	Total output per year	435 kWh
	Available output per year	326 kWh
	Cost per kWh	11.6d.
No. 5.	Capital outlay	£900 0 0
	Annual charges	£130 13 4
	Total output per year	10,195 kWh
	Available output per year	7,646 kWh
	Cost per kWh	4.1d.
No. 6.	Capital outlay	£415 0 0
	Annual charges	£59 4 8
	Total output per year	4,768 kWh
	Available output per year	3,576 kWh
	Cost per kWh	4.0d.
No. 7.	Total output per year	491 kWh
	Available output per year	368 kWh
	Cost per kWh	10.3d.

To the question: Does the cost per kWh of electricity produced by wind power compare favourably with the electricity available from other sources? it may be directly replied that

* Oxford: Clarendon Press, Bulletin No. 1, price 2s. 6d. net.

the wind-mill method of power production does stand in a favourable position. Although at a first glance it would seem that the cost per kWh in the case of the smaller sets is high, it is obviously wrong to compare the results from 250- and 400-watt sets with those from larger plant of other types, and it is questionable whether any other form of electricity-generating plant, of the same rating, will bear comparison with small windmill sets on the score of the cost per kWh of energy produced. The medium-size plant gives figures that will compare favourably with the lighting rates of all but extremely happily situated supply companies, while the cost of the power produced by the larger sets is lower than most lighting rates, and almost as low as the power rates of several public companies. The cost, therefore, of windmill-generated electricity, either for small lighting or for small power purposes, is quite reasonable and such as to justify a wider use. When it is said that the costs compare well with those of supply companies, it is not implied that this form of power should be preferred to public supply: it would be absurd to neglect connection to a main supply line if at all possible.

Reliability and continuity of supply are in very many cases more important than cost, and any satisfactory settlement of doubts on this head will do more to encourage a wider use of windmills than any phenomenally low cost per kWh. Continuity of supply throughout the year will be assured, provided that care is exercised when selecting a plant to plan the load to suit the set at all seasons of the year. It may then be safely taken that there will never be a hitch in the working, except under extremely exceptional conditions, the chances of which are little greater than in any other form of power production. Care should also be taken to select a site in which there is nothing to interfere with the prevailing winds; at the Harpenden station the S. and W. winds, during the period of observation, constituted 75 per cent. of the total hours of wind per year. As regards amount of wind, the Harpenden site is perhaps above the average for lowland country, but in higher and more coastal districts better performances might be expected than those recorded in the report.

Those who, already owning an engine generating set, desire to supersede or supplement it, should have little hesitation in adopting wind-power. All over the country there are engine sets which have had a useful life and are now hardly fit for regular running, but could be used occasionally to charge the battery. The windmill set would provide the bulk of the supply, while the engine could make good any occasional deficiency, thus enabling a smaller plant to be chosen than would otherwise be necessary.

The Electrical Imports of Spain.

THE following figures, showing the imports of electrical goods into Spain in 1925, are taken from the recently issued trade statistics. The totals for 1924 are given for purposes of comparison, but it is not possible to show the shares of the supplying countries in that year:—

	Quantities. 100 kilogs.
Dynamos, motors, transformers, switchgear, &c.—	
Total imports (1924)	54,973
(1925)	52,902
of which from:—	
Germany	14,817
United States	10,163
France	7,300
Great Britain	5,311
Sweden	2,392
Belgium	2,388
Switzerland	1,851
Self-contained generating sets—	
Total imports (1924)	3,626
(1925)	3,397
of which from:—	
Germany	1,334
France	1,264
Great Britain	348
United States	154
Switchboards—	
Total imports (1924)	1,402
(1925)	1,332
of which from:—	
Germany	383
United States	274
France	240
Great Britain	173
Electrical fittings (switches, lampholders, &c.)—	
Total imports (1924)	4,513
(1925)	7,810
of which from:—	
United States	2,981
Germany	1,816
Great Britain	1,219
Electrical measuring instruments and parts thereof—	
Total imports (1924)	1,817
(1925)	1,991
of which from:—	
Germany	1,243
France	251
Switzerland	379
Great Britain	44
Stoves, heaters, cookers, irons, &c.—	
Total imports (1924)	460
(1925)	568
of which from:—	
Germany	157
Switzerland	230
Accumulators, dry batteries, and parts—	
Total imports (1924)	4,961
(1925)	7,618
of which from:—	
Denmark	1,672
Germany	1,121
Great Britain	1,066
United States	966
France	917
Norway	501
Wires and cables—	
Total imports (1924)	6,563
(1925)	13,037
of which from:—	
Great Britain	4,926
Germany	4,286
France	1,542
United States	880
Telegraph and telephone switchboards and apparatus—	
Total imports (1924)	1,633
(1925)	3,647
of which from:—	
France	979
Belgium	655
Germany	598
Great Britain	534
United States	397
Sweden	355
Incandescent electric lamps—	
Total imports (1924)	601
(1925)	666
of which from:—	
Holland	411
Great Britain	77
France	5
Electric mercury vapour lamps, searchlights, &c.—	
Total imports (1924)	85
(1925)	82
of which from:—	
United States	33
France	12
Arc lamps and parts, &c.—	
Total imports (1924)	21
(1925)	15
of which from:—	
Germany	10
France	3
Holland	1
Carbons, other electrodes, &c.—	
Total imports (1924)	4,103
(1925)	3,486
of which from:—	
United States	1,181
Great Britain	1,002
Germany	773
France	44
Insulating tapes, fabrics, and tubes—	
Total imports (1924)	206
(1925)	8,159
of which from:—	
United States	4,906
Germany	3,127
Great Britain	22
Switzerland	13

A Topical Exhibit.—In collaboration with the Telephone Development Association, the Automatic Telephone Manufacturing Co., Ltd., principal manufacturer of the Strowger system now in process of installation for the British Post Office throughout Greater London and the provinces, has presented to the Science Museum, South Kensington, actual specimens of typical components of the system. The exhibit, which will be displayed in the Telegraph, Telephone, and Wireless Section of the Museum, comprises four items, separately mounted and arranged for convenient inspection by the public.

The Electricity (Supply) Bill.

The Proceedings in Committee.

(*Continued from page* 811.)

THE Standing Committee of the House of Commons resumed consideration of the Electricity (Supply) Bill, which was adjourned during the Whitsuntide recess, on Thursday, June 3rd. Sir Robert Sanders presided.

Discussion was begun on clause 2, which deals with the general powers and duties of the Central Electricity Board, set up under Clause 1.

Mr. G. BALFOUR (Hampstead, U.) moved an amendment to provide that the duties of the Board should be to consider and settle schemes prepared under Clause 4 of the Bill. He said that his amendment merely followed the modification which was agreed to by the Minister in charge of the Bill on the second day of the Committee proceedings. That modification changed completely the character of the Bill. It provided that the duties which were originally intended to be carried out by the Board should be carried out by the Electricity Commissioners. The object of the amendment was to try and carry out in a non-contentious manner that which had been agreed on by the Minister. The Board originally was to frame schemes, but now it was to be constituted as a tribunal to consider schemes which were submitted to it by the Electricity Commissioners. He was simply endeavouring to put into this clause the appropriate words to give effect to the changes already agreed upon; to define the new duties of the Board as agreed by the Committee. If his amendment was carried, he intended to move a further amendment providing that the Board, instead of supplying electricity, should co-ordinate the supply of electricity.

Sir DOUGLAS HOGG, the Attorney-General, said that the Government was not prepared to accept the amendment. There appeared to be some extraordinary misapprehension in the mind of Mr. Balfour. He had repeatedly referred to something which had been "agreed upon" on the second day of the proceedings under which the whole scheme had been completely altered, and to which he contended that effect would be given to by his amendments, under which the duty of supplying electricity was to be no longer one of the functions of the Board. Never had there been a suggestion in the minds of the Government to agree to anything of the kind, and it regarded the duty of supplying electricity as one of the cardinal features of the Bill. The amendment was wholly unnecessary. The clause purported to define the general powers and duties of that Board, and began by saying that the Board should be charged with the duty of supplying electricity, and that the further powers and duties of the Board should be such as were provided under the Bill. One of those further powers consisted of the duties laid down under Clause 4 with regard to the preparation of schemes. But the essential and permanent function of the Board was to carry out the duty of supplying electricity. Before that could be done, schemes had to be settled in order to carry out the plan of the Bill, and for that purpose powers were given in Clause 4, when they came to it, and were referred to in Clause 2.

Mr. ATTLEE (Limehouse, Lab.) opposed the amendment, which he described as a wrecking amendment, and one which would destroy the whole object of the Bill.

Sir J. MARRIOTT (York, U.) said that he had listened with astonishment and dismay to the speech of the Attorney-General. He did not for a moment suggest that there was anything in the nature of an agreement in Clause 1 in the sense in which the word "agreement" was often used in the House, but he did suggest that on Clause 1 such a fundamental change was made in the texture of the Bill, with the assent of the Government, that some members felt that they would be compelled to adhere to Mr. Balfour's present amendment and his consequential amendment. Was it suggested that the Bill was not a Socialistic measure? He was under no misapprehension as to the purposes of the Bill.

Sir JOSEPH NALL (Manchester, Hulme, U.) contended that the Attorney-General let the cat out of the bag when he said that the chief function of the Bill was to set up a State Electricity Department.

Sir FRED. HALL (Dulwich, U.) declared that they were being asked to support a Socialistic measure introduced by a Unionist Government, and Unionist members were being asked to assist in making the Bill appear as innocent as possible. He and many members of the Unionist party were bitterly opposed to the Bill.

Mr. BALFOUR asked the Attorney-General whether he did or did not agree that the functions of the Commissioners and of the Board had been turned round. The Minister of Transport definitely said so at a previous sitting. If that was so, did not the Attorney-General agree that one of the principal functions of the Board would be to consider and settle schemes prepared under Clause 4?

Sir DOUGLAS HOGG: "So far as Clause 4 is concerned, I agree that before the adjournment for Whitsuntide I agreed that, instead of the Board preparing the scheme and putting it up to the Commissioners, the Commissioners should prepare the scheme and put it up to the Board, but it is no more the essential or main duty of the Board to settle schemes than it was previously its main duty to prepare them. The main and permanent features of the Board are to carry out and administer schemes when settled, and that will involve supplying electricity. So far as Clause 4 is concerned, the amendment is unnecessary unless you are going to carry the consequential amendment to provide that the Board should only co-ordinate the supply of electricity, and that the Government regards as vital and as involving the destruction of the Bill."

The amendment was negatived by 37 votes to 13.

Mr. CLAYTON (Widnes, U.) then moved Mr. Balfour's second amendment, to provide that the Board should co-ordinate the supply of electricity, and not supply electricity. The object of the amendment, he said, was to obviate making it obligatory on the Board to supply electricity. There was nothing in the amendment to prevent the Board supplying electricity if no other suitable sources of supply were available.

Sir DOUGLAS HOGG opposed the amendment, which, he said, would take from the Board the duty of supplying authorised undertakers with electricity. Such a proposal went right to the root of the Bill.

Sir JOSEPH NALL, who supported the amendment, said that the main function of the Board would be to interfere with every existing undertaker in the country. In no other country was such a system in force, nor had it been tried, except in Ontario. What was the case for encumbering the electricity supply of this country with the machinations of this new Department? The figures in the Weir Report, on which the Bill was based, were deliberately misleading. The whole case for this attempt at State Socialism in the supply of electricity was founded on a table of consumption of units per head of the population contained in the Weir Report—one of the most obviously misleading documents ever produced. That table had been manipulated so as to prejudice the position of Great Britain. If it was to be the business of the Board to supply electricity, then it would have to charge the distributing undertakers something more on the current distributed than the actual cost at which they generated. If that scheme was carried out, obviously the big industrial areas were going to have to carry, in addition to their own costs, a figure to cover the loss incurred in extending distribution in rural and undeveloped urban areas. He maintained that the existing electricity supply in this country was as efficient as that in any other country. If a State authority of this kind was to interfere with the great undertakings in this country, it was obvious that electrical development was going to be held up for a long time. The great municipalities, no less than the company undertakings, could not proceed with schemes of development during the passage of the Bill, and the time taken for the consideration of schemes framed under the Bill. Hence, at least a year or two must elapse before development would proceed.

Mr. WADDINGTON (Rossendale, U.) declared that the chief need of Lancashire was a cheap supply of electricity, and he doubted whether the Bill would achieve that end.

Mr. SANDEMAN (Middleton, U.) contended that the price of electrical energy would be increased by the expenses of this very costly Electricity Board.

Mr. E. HARMSWORTH (Thanet, U.), in opposing the amendment, said that anyone who had business in Canada and America knew that that business would be impossible to work were it not for a supply of cheap electricity. It was only when one compared America with this country that one realised how far behind British electrical undertakings were. Although the Bill was not perfect, it was a step in the right direction.

Mr. P. J. HANNON (Moseley, U.) said that there was a feeling in the industrial areas that they were not getting served with cheap electricity as well as they might be under some such comprehensive scheme as was contemplated in the Bill.

Mr. G. BALFOUR gave a number of facts and figures to show the growth of electrical development in this country, and asked: "Why gull the country with the cry of 'Electricity for all at a penny per unit'?" His understanding of the functions of the Board was that it should be a judicial body of arbitrators, to whom the Commissioners would submit complete schemes for analysis. He agreed that if there was any hold-up of development anywhere then, in the last resort, the Board must be clothed with full powers to overcome that obstacle. He did not agree that one of the functions of the Board should be to supply electricity.

Mr. LAMB (Stone, U.) said that agriculturists in this country had not a cheap supply of electricity comparable with the supply available in other countries. There was a genuine demand from the rural areas for cheap electricity for power and light. He opposed the amendment, which he did not think would lead to that demand being met. Under present conditions the rural areas had not had a fair chance.

The amendment was negatived by 37 votes to 13.

Mr. KELLY (Rochdale, Lab.) moved an amendment to delete from Clause 2 the words "but shall not, save as hereinafter expressly provided, themselves generate electricity." He explained that he did so in order to ensure that the Board would

be able to engage in the generation of electricity where desirable.

Col. ASHLEY, the Minister of Transport, said it had already been stated that this was not a Socialist Bill, but the amendment was an attempt to extend the scope of the Bill that would make it into a Socialist Bill by allowing the Board perfect freedom to generate electricity. The intention of the Bill and of the Government was that the generation of electricity, as heretofore, should remain, under the Bill, if at all possible, in the hands of private companies or the municipal authorities which were now generating. The Government hoped that in 99 cases out of 100 that would be so, and that private or municipal enterprise would not be interfered with any more than was absolutely necessary to secure co-ordination.

Sir JOSEPH NALL said that in a later clause it was laid down that the Board would not be able to undertake generation unless it satisfied the Electricity Commissioners that it was unable to enter into an arrangement with any authorised undertakers to operate it on reasonable terms. That was rather anomalous, for the Board was the superior authority and not the Commission. He opposed the amendment.

Mr. ATTLEE thought that the Board should be able to take over generating stations and pointed to the London scheme of co-ordination as a precedent.

Mr. G. BALFOUR said that the position of the London undertakings was entirely different from what Mr. Attlee imagined. There was no question of "taking over." The companies came forward voluntarily for powers to group, and many difficulties were encountered.

Sir FRED. HALL said he was entirely in favour of bulk production. It was only by bulk production and super-stations that they could hope to generate and distribute electricity on the most economical lines. But he was sure that no undertakers would refuse to carry distribution lines into areas where there was reasonable prospect of return. Private enterprise had developed the undertakings in the past as rapidly as possible.

The amendment was rejected by 30 votes to 11.

Sir PHILIP DAWSON (Lewisham, W., U.) moved to allow the Board to enter into arrangements with any authorised undertakers or other bodies without first obtaining the approval of the Electricity Commissioners.

Col. Ashley accepted the amendment, which was carried by 32 votes to 12.

The Committee then adjourned until June 7th.

(To be continued.)

Radio-Communication.

Mr. C. F. Elwell on its Past, Present and Future Aspects.

(Abstract of Paper read before the ROYAL SOCIETY OF ARTS.)

IN his recent paper before the above-named Society, Mr. C. F. Elwell reviewed some of the signal services which radio-communication had rendered in the past, and possible future uses. Dr. W. H. ECCLES, F.R.S., who presided, in introducing the author, referred to his past work and achievements, pointing out that, especially during the war years, the genuineness of his improvements in wireless engineering was amply substantiated. Mr. Elwell had supplied large arcs and high masts to various Allied Governments; for instance, at Rome he had erected for the Italian Government, during the war, a station containing two arcs of about 200 kW each and three masts more than 700 ft. high in the record time of about four months, which was a wonderful achievement when one considered the war-time conditions which prevailed and the limitations with regard to materials and labour.

Mr. C. F. ELWELL did not confine his remarks to the achievements of radio-communication alone, because it had helped other arts which, in their turn, had helped radio-communication with its problems. For example, the debt which telephone engineers owed to radio-engineering was now being repaid by the assistance which telephone engineers were giving in the solution of the problem of commercial two-way transatlantic radio-telephony

Dealing first with radio telegraphy, he divided it into three classes:—(*a*) Communication over distances where wires or cables could not be laid; for example, with moving ships, trains, aeroplanes, motor-cars, &c.; (*b*) communications over distances which otherwise could only be spanned by means of expensive cables, for instance, with submarine cables; and (*c*) communication over distances which otherwise would be served by means of overhead wires or underground cables, *e.g.*, in competition with wire lines. Naturally, radio-telegraphy experienced no serious competition in the first class, and it was along these lines that it rendered its most valuable services. There were to-day about 16,500 ships equipped for the transmission and reception of radio-telegrams, and, to give them adequate service, some 1,600 land stations were being maintained.

The second class was a natural sphere for radio-communication, because of the great expense of laying long submarine cables and their liability to interruption. For a fraction of the cost of a submarine cable a practically uninterrupted service could now be given by two radio stations, which also had the great advantage of being able to communicate with many points. Greater efficiency of transmission was claimed for cables because messages could be sent to the ends of the earth with the aid of a few batteries, whereas the radio engineer in the past had been compelled to use many hundreds of kilowatts to accomplish the same end, but it could not be assumed that this condition of affairs would exist much longer, and it might not be long before the cable companies' strongly entrenched position would be assailed. For already established economic reasons radio could give a very good commercial service more cheaply than cables; the radio stations at San Francisco and Honolulu had caused a reduction of the ordinary message rate from 1s. 6d. to 1s. per word, and of the Press rate from 8d. to 1d. per word. The direct result of the reduction of the Press rate was an immediate increase in the quantity of world's news transmitted to Honolulu, the daily average of about 100 words having been increased to an average of about 1,500. Another example was the admission by the President of the Western Union Cable Co. in his annual report for 1924 that radio was responsible for 30 per cent. of the traffic across the Atlantic. The strategic value of radio to the Empire was in itself enormous. It could not be said that radio had made such an impression in competition with wire-line telegraphy, but it had exerted a healthy influence on the lowering of rates. In times of storm, too, radio had rendered signal services in maintaining communication.

The future possibilities of radio-telegraphy in class (*a*) had not yet been fully developed. The cost of telegrams from ship to shore and ship to ship was excessive, and this class of communication should not be kept on the plane of emergency telegrams only. In class (*b*) advances in radio-communication methods and apparatus should continue to cause reductions in the cost of maintaining communication with distant countries. In class (*c*) the increasing use of underground cables should tend to relieve radio, with its somewhat restricted gamut of wavelengths, for more useful service in the other two classes.

Radio-telephony might in time eclipse radio-telegraphy, and was subject to the same classification. The possibility of employing the ordinary subscriber's apparatus to talk to ships at sea had already been proved, and relaying of wire-line telephony had even been done after the speech had been transmitted 5,500 miles. It was possible to telephone over much greater distances by radio than over submarine cables, and the recent radio-telephone experiments between London and New York showed how close was its commercial application.

Miscellaneous applications included direction-finding, beacons, leader cables, echo depth-recording, time signals, weather reports, and systems for the amplification of speeches to large audiences. Approximately 260 British ships alone had been equipped with direction-finding apparatus, and 85 stations had been equipped for emitting signals of such a nature as to assist ships in locating their position, or to assist aeroplanes in landing. The echo depth-recording system could be used for depths up to 4,000 metres.

A number of problems still open to the radio engineer for solution were mentioned, and, in conclusion, Mr. Elwell urged that, in order that progress might continue, serious amateur investigators should be accorded liberal treatment.

Discussion.

Capt. R. H. RANGER (engineer to the Radio Corporation of America, who is in charge of picture transmission across the Atlantic) said that during the strike he had been swamped with demands to send pictures from this country to America; in fact, it was almost a question whether the transmission of words or pictures should take precedence. He saw the world as nothing but a small room; a signal from a "beam" station went round the earth and came back and echoed eight times, "so that we are in a small room, and the echoes from the wall disturb us." The combination of the radio compass with the gyroscopic compass was a great advance and had made feasible commercial navigation in and out of San Francisco, where fogs were tremendous.

Dr. W. RUSHTON-PARKER asked whether echo depth-recording could be made continuously from a ship steaming at ordinary speed.

Mr. MENZIES (secretary of the Royal Society of Arts) asked whether the use of the two-electrode valve in connection with the precipitation of dust might not have some practical application in the home.

Lieut.-Colonel H. P. T. LEFROY referred to the possible applications of radio in the navigation of aircraft, where drift was very great, and to the importance of developing methods of preventing collisions of aircraft, in view of the great speed at which two aeroplanes approached each other. There were possibilities in the use of the cathode ray, which would give instantaneous warning of danger approaching.

The CHAIRMAN emphasised the fact that high-frequency engineering traversed all sides of physics, and upon it, therefore, all branches of physics and all applications of physics reacted.

Mr. C. F. ELWELL indicated that he would reply fully to the discussion in writing.

Kolster Radio Compasses.—Arrangements have been completed between the Federal Telegraph Co. and the U.S. Coast Guard Service for the installation of Kolster radio compasses on six more of the coastguard vessels, which will make a total of 17 vessels of the coastguard service equipped with such compasses as an aid to navigation.

Selected Radio-Telephone Apparatus.

Recent Developments and Improvements.

Another "PM" Valve.

One of the latest additions to the "PM" group of valves manufactured by the Mullard Radio Valve Co., Ltd., is a low-impedance pattern which is very suitable for loud-speaker operation. Its constants are as follows:—

Filament voltage	... 1.4-1.8 volts
Filament current	... 0.15 amp.
Anode voltage	... 50-100 volts.
Total electron emission	... 20 mA.
*Anode impedance	... 8,750 ohms.
*Amplification factor	... 5.4.
*Mutual conductance	... 0.62 mA/volt.

(*At anode volts = 75 and grid volts = zero.)

The valve and its characteristics are shown in figs. 1 and 2; it is primarily a low-frequency amplifier, and is suitable for

Fig. 1.—Mullard "PM2" Valve.

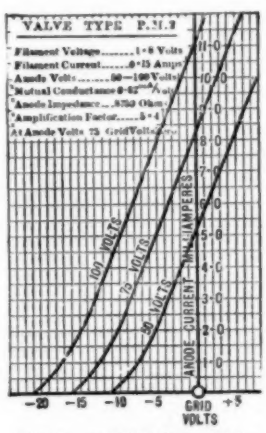


Fig. 2.—"PM2" Power Valve Characteristic Curves.

use when followed by l.f. transformers, loud speakers, or any low-impedance circuit, and negative grid bias voltages of 4, 7 and 10 V should be applied with anode voltages of 50, 75 and 100 V respectively.

When used as a detector the grid return lead should go to the positive limb of the filament and when used for high-frequency amplification an anode voltage of from 50 to 100 may be used. The valve will respond readily to reaction, and its filament is practically invisible when run under correct working conditions; the low working temperature preserves the ductility of the "V"-shaped filament and lengthens its life. Besides the low current consumption another advantage is the large grid swing available; with 100 volts h.p. the grid bias is roughly 20 volts and this permits the valve to deal with strong signals.

The "Remocon" Coil Stand.

A coil stand that has advantages not found in the usual forms of holder is shown in fig. 3, the illustration being self-explanatory. It is marketed by the Economic Electric Co., Ltd., and is used chiefly in American type receiver cabinets,

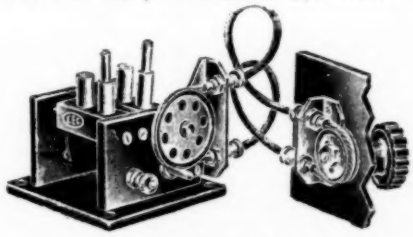


Fig. 3.—The "Remocon" Coil Stand.

the coil stand being fixed in the most convenient position and the control knob mounted remote therefrom elsewhere on the panel without interfering with the working, the movement being transmitted without back-lash by sheathed wires as indicated.

An Hotel Installation.

The wireless distributing scheme which is being installed in the Hotel Cecil, London, provides for broadcast reception in the sitting rooms of the different suites of rooms in the hotel. The apparatus is capable of picking up any of the Continental stations in addition to British stations, the super-heterodyne set being used with either frame aerial or outside aerial, the latter having been erected on the roof. A power amplifier raises the volume energy to a level that enables distribution to be made by lead-covered cable throughout to receiving points (of which there are 20) consisting of two single-earpiece lorgnette type receivers and associated key box. The receiver is the well known 7-valve set manufactured by Standard Telephones & Cables, Ltd., will receive on any wave-length between 300 and 3,000 metres, and is simple to operate as there are only two variable adjustments, one being in the aerial circuit, the other in the oscillator circuit. The setting of these two variable condensers is very critical, but the delicate gearing makes the set easy to use. "Wecovalves" are used with bayonet sockets and in order to avoid direct coupling between stages owing to stray magnetic fields, each stage is completely shielded. There are six tuned circuits in the set, of which only two are variable and the frame aerial has its centre point connected to the earth side of the set, which has the desirable effect of improving its directional properties and so increasing the selectivity of the set as a whole. The set is, however, also provided with a special tuning unit which enables it to be used in conjunction with a standard outside aerial.

The two-stage amplifier has a dial switch for controlling the energy delivered into the system and a step-down transformer is provided in order that the output impedance of the amplifier shall balance the impedance of the load into which it works. The power valves need 6 volts for the filament circuits and 120 volts for the anode circuits. Two main feeder cables supply each floor, terminating at small distributing boxes and at the amplifier end on a terminal board arranged so that testing the main cables is an easy matter. The main cables (of which there are ten) consist of No. 18 S.W.G. twisted-twin v.i.r. and l.c. cable. From the distributing boxes on each floor similar lead-covered twin cable extends to each of the receiving points, the cable used for this purpose being No. 22 S.W.G. twin enamelled d.c.c. and l.c. cable. The reason for the use of two distributing boxes on each floor is that should a fault develop in any part of the system on the cabling, it will only be necessary to cut off one-half of one floor whilst such a fault is traced and repaired. The receivers normally hang upon hooks on the wall and a small key box is also provided at each receiving point which contains a switch so that when the receivers are disconnected from the line, in place of them a resistance is connected of such value that it is equivalent to the joint impedance of the two headphones in parallel. The actual load on the system, therefore, is the same whether the key is in the operating or non-operating position, and the volume of sound received at any particular receiver point will be the same irrespective of the number of receiving points in use. The whole of the apparatus in use throughout the system has been supplied by Standard Telephones & Cables, Limited.

Universal Coil Holders.

Coil holders that will appeal to "constructors" on account of their applications are illustrated in figs. 4 and 5, being a product of the Igranic Electric Co., Ltd. The spacing betwe n the contact pin and socket may be varied from 9/16 up to 2 in., rendering the holders suitable for accommodating standard plug-mounted coils, or low-loss coils having widely spaced contacts, such as Igranic "XLLOS" coils, in which the spacing of the contacts may be varied in a similar manner. The pin

Figs. 4 and 5.—Igranic Coil Holders.

and socket are separated by an air space which confines the self-capacity of the holder to a low value. The contact pin may be removed by unscrewing, thus providing for mounting coils having two contact pins. The limbs being independent units, one, two, or three of them may be used as single, two-way, or three-way holders. Ebonite extension handles which facilitate operation and obviate hand-capacity effects are supplied with the two-way and three-way combinations, and the metal parts are nickel plated.

A.T.M. Contributions to Liverpool Hospital.—During the year ended May 29th last the employés of the Automatic Telephone Manufacturing Co., Ltd., raised, by means of a "Saturday fund," £405 for the Liverpool Hospital. Since the fund was instituted in 1912, £2,055 has been contributed to the hospital.

An Experiment in "Customer-Ownership."

Success of a Recent Stock Issue in Canada.

By R. E. TURNBULL.

"CUSTOMER-Ownership" means the owning of the shares in a public utility company by local residents. The advantages of this system are that it is the best method of maintaining the goodwill of the public. If the shares of a company are held by the people who every day make use of the services of that company, it becomes something in the nature of a co-operative society. The public take a greater interest in it and know they are benefiting by any profits it makes. It relieves the company of many false accusations of profiteering. If a man possesses even one share it gives him a sense of ownership and a feeling of pride and patriotism when he sees the business is worked efficiently and on a paying basis.

The idea has of late years become very popular in the United States and Canada, and it was for the reasons given that, a few months ago, the British Columbia Electric Railway Company, Ltd., turned its attention to this method of raising fresh capital.

Readers of the ELECTRICAL REVIEW have long been familiar with the operations of this company, but a few words here about its status will be of interest: It was incorporated in 1887, and has since grown to be a very large undertaking. It supplies transportation, electric light, heat and power and gas, over a territory of 1,500 square miles on Vancouver Island and on the lower mainland of British Columbia in the vicinity of Vancouver and district. The capital expended in the province already amounts to about £14,000,000. The company has 3,000 employés, 87,000 light and power customers, and 30,000 gas customers. There are seven hydro-electric power plants with a total capacity of 202,000 h.p., and it is principally for the purpose of increasing this power capacity and developing the Bridge River site, where a further 700,000 h.p. is available, that fresh capital is required.

Hitherto, the difficulty in selling stocks or shares of the B.C.E. Railway Co. in British Columbia has been the fact that the company is an English company, with its capital in pounds sterling, and its dividends and income subject to English income-tax. For this reason, a subsidiary of the railway company was incorporated in British Columbia and called "The British Columbia Electric Power and Gas Co., Ltd."

The railway company had in the past owned the capital stock of a number of subsidiary companies, such as the Vancouver Power Co., Vancouver Gas Co., Victoria Gas Co., B.C. Rapid Transit Co., &c. The capital stock of all these subsidiary companies was purchased by the new company for $15,248,012, in return for which it issued to the B.C.E. Railway Co. common stock for the same amount. The new company then made an issue of $5,000,000 of 6 per cent. cumulative preference shares whose dividends were guaranteed by the parent company. Of this amount, only $2,250,000 was offered to the public, $1,500,000 being underwritten by a syndicate of bondholders, and the remaining $750,000 (about £150,000) allotted to employés of the company, either to buy for themselves or sell to local residents. The price was $99 to the public. Applications for shares were restricted to 50 shares each, and had to be from residents of British Columbia.

The advertising campaign was scheduled to begin on March 19th, and the selling on March 20th, but news of the impending issue aroused such interest that the forms had to be released on March 15th. On the first day, almost the entire original allotment to employés had been sold. The prospectus stated that the subscription list would be closed on March 31st, but it had to be closed on March 20th, and the company had to request employés to do no more canvassing.

When the final results were complete, it was seen that the company, which had expected to sell $750,000 shares through its employés, had received applications for $5,650,000, and that the employés had subscribed for no less than $602,000 themselves.

The outcome of the "customer-ownership" campaign is that many records have been broken, not only for Canada, but for the whole of the North American continent. Only two companies on the continent are known to have more "customer-owners" in proportion to their customers, and then only after several years of effort. Another record for the first sale is that 47 per cent. of employés of all branches on the permanent pay-roll now own shares in the company. This wonderful response to the issue may be attributed to the high reputation for efficiency, progress, and good service which the company has attained among the residents of B.C. and the fact that a spirit of courtesy has been encouraged among its employés when dealing with the public. The company has lowered its rates repeatedly whilst the large amount of capital spent in the province has been a great help to industry and general development.

The B.C. Electric will now have 11,000 shareholders in the province of British Columbia. These shareholders are not "capitalists" in the ordinary sense of the word, but small investors, such as clerks, labourers, school-teachers, artisans, professional men, &c., who have invested their savings in this local business, and will watch its progress with added interest.

Commenting on the issue and its result, Mr. George Kidd, president of the B.C.E. Railway Co., Ltd., writes:—"We timidly thought of asking our patrons for $1,000,000, or possibly $1,500,000, and ultimately, with some misgiving, fixed on $2,250,000. But what has happened? In less than a week applications for $7,155,400 were in our hands, and when we closed the list they were still pouring in. Our success has been almost embarrassing. We really do not need all this money just now, but, rather than disappoint our friends more than is absolutely necessary, we decided to accept $5,000,000. And now a word about our employés. For the confidence so abundantly displayed by the public, we are in a large measure indebted to the efficiency and courtesy of our employés. The goodwill which has been built up, largely by the employés themselves, enabled them, when asked to sell $750,000 of our shares, to bring in 10,245 applications for $5,655,900. Surely an astonishing record!"

The Water-Power Resources of Canada.

THE annual review of the water power resources of Canada, issued by the Dominion Water Power and Reclamation Service of the Department of the Interior, states that the year 1925 witnessed the unprecedented increase in Canada's hydro-electric installation of 718,984 h.p., bringing the total installation for all purposes to the imposing total of 4,290,428 h.p., or 465 h.p. per 1,000 of population. While actual construction during 1925 was confined to only four of the provinces, British Columbia, Manitoba, Ontario and Quebec, considerable activity preliminary to construction was evidenced in other provinces. While it is hardly to be expected that 1926 will witness activity equal to that of the past year, there is sufficient construction under way or in prospect to maintain the high average of recent years. That the limit of individual plant capacity has not been reached even by the great stations recently constructed is indicated by the inception of a plant on the Saguenay River of 800,000 h.p. ultimate capacity, while plans for an enterprise of almost equal ultimate capacity on the Bridge River in British Columbia involving the development of a series of sites are in course of preparation. The known available water power in Canada, from all sources and within the limitations outlined, is 18,255,000 h.p. for conditions of ordinary minimum flow and 32,076,000 h.p. ordinarily available for six months of the year. It is believed that these are conservative estimates since an analysis of the water power plants scattered from coast to coast concerning which complete data are available as to turbine installation and satisfactory information as to stream flow, gives an average machine installation 30 per cent. greater than the ordinary six-month flow power. Applying this, the figures quoted above, therefore, indicate that the present recorded water power resources of the Dominion will permit of a turbine installation of 41,700,000 h.p. The present turbine installation represents only 10¼ per cent. of the recorded water power resources. The following table shows the distribution and development of hydro-electric resources:—

Province.	Available 24-hour power at 80 per cent. efficiency. At ordinary min. flow, h.p.	At ordinary 6-months flow, h.p.	Turbine installation h.p.
British Columbia	1,931,142	5,103,460	414,702
Alberta	475,281	1,137,505	34,107
Saskatchewan	513,481	1,087,756	35
Manitoba	3,270,491	5,769,444	183,925
Ontario	4,950,300	6,808,190	1,784,842
Quebec	6,915,244	11,640,052	1,747,386
New Brunswick	50,406	120,807	44,631
Nova Scotia	20,751	128,264	65,327
Prince Edward Island ...	3,000	5,270	2,274
Yukon and Northwest Territories	125,220	275,250	13,199
Available and developed water power in Canada: Totals ...	18,255,316	32,075,998	4,290,428

During 1925 the new installation in Quebec was 438,300 h.p., of which 360,000 h.p. was contained in a single station on the Saguenay River. In Ontario practically 200,000 h.p. came into operation, of which nearly three-quarters was due to the efforts of the Hydro-Electric Power Commission, leaving a substantial remainder to the credit of private enterprise. In Manitoba no new stations were established, but an existing plant was enlarged by 22,000 h.p. In British Columbia water power activities were marked and nearly 90,000 h.p. was installed.

The 4,290,428 h.p. at present installed throughout the Dominion is apportioned to the following uses:—3,466,422 h.p. (80.8 per cent. of the total) in central electric stations for general distribution; and 481,971 h.p. (11.2 per cent.) installed in pulp and paper mills. In addition pulp and paper mills purchase about 275,000 h.p. from central electric stations, making a total of nearly 757,000 h.p. used in the manufacture of pulp and paper. 342,035 h.p. (8.0 per cent.) is installed in industries other than central electric stations and pulp and paper mills.

At the present time there are 297 hydro-electric central stations in Canada, and of this total 209 stations, with a combined capacity of 2,230,848 h.p., are owned by commercial organisations, while municipal or other public organisations operate 88 stations with an aggregate possible output of 1,235,574 h.p.

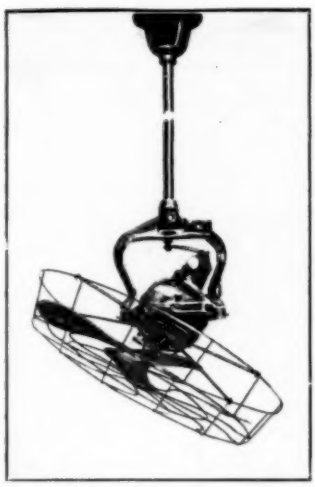


Fig. 1.—Ceiling Fan.

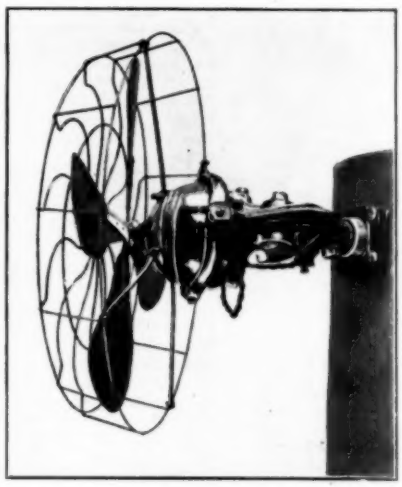


Fig. 2.—Wall Fixing.

The fortunate existence of enormous supplies of pulp wood in close proximity to the water powers, which are readily developable and sufficient to furnish the large quantities of power demanded by this industry, has placed Canada in the favourable position she occupies in this direction. A recent development of interest affecting the power consumption of this industry is the rapid adoption of electric boilers as a means of transforming any surplus of available electric energy into steam for pulp cooking, drying, heating, &c.

The modern development of water power in Canada began with the last decade of the nineteenth century by the end of which approximately 170,000 h.p. had been installed. Since then there has been an ever-growing rate of progress which brought the total to 4,290,428 h.p., culminating in the record installation of 1925. With new uses for electricity constantly appearing there is every reason to believe that the past growth will not only be continued, but accelerated. Chief among these new uses may be enumerated the electrification of steam railroads, the application of electric heat to manufacturing processes, the extension and use of electric boilers for process steam, electric refrigeration, and the many other domestic and commercial uses constantly appearing. A conservative estimate of the capital investment in Canadian water powers amounts to $815,723,890.

Electric Fans.

The Production and Dispatch of the Orbit Oscillating Fan.

WITH the approach of the summer months the electrical manufacturing and contracting industries are directing their energies to meet the anticipated demand for electric fans, which increases by leaps and bounds every year. We have received from Messrs. Veritys, Ltd., some particulars of the special steps which they have taken to deal with the demand this year, both at home and abroad. A complete range of the new "Orbit" 1926 elliptical oscillating fans (patented throughout the world) is being marketed. The majority of oscillating fans at present on the market travel backwards and forwards in a horizontal plane; but there is a demand for a fan covering a larger fanning area, and it is to meet this demand that the "Orbit" has been produced. It is claimed that the oscillating movement of this machine is unique. It is partly vertical and partly horizontal, resulting in an elliptical movement with an increased area. The fans are suitable for desk, bracket, or ceiling fixing. For the ceiling fans, fig. 1, the oscillating movement is slightly different, being more circular than elliptical, and an angle of 30 deg. from the horizontal is maintained by the fan blades. A special shoe into which the fan securely locks is provided for low ceilings, a downrod and shackle being provided for high ones. In addition a tilting device allows the operation to be directed to different parts of the room, if required, without disturbing the fixing arrangements. This fan, it is claimed, works equally well when fixed to a wall, fig. 2. No brushes or electrical contacts are employed in connection with the movement, and the fan should prove particularly suitable for places where it is not convenient to use the pedestal type. An important feature in the distribution of their products is the employment by the makers of a special means of packing. Each fan is packed separately and fully assembled in a strong cardboard box, fig. 5, so that it arrives at the consumer's end ready for immediate use. No straw or similar packing is used and the internal dimensions of the box are only just sufficient to accommodate the fan. Very consider-

Fig. 3.—Packing Department.

Fig. 4.—Fan-Assembling Shop.

Fig. 5.—The "Orbit," Packed.

able thought has been given to the packing of these fans, and many experiments were carried out before it was considered that a desk fan could be dispatched complete in a cardboard box ready for re-distribution. It is realised that prompt delivery in the fan trade is as important as low prices, and arrangements have been made to keep large stocks of fans for all voltages and periodicities ready for immediate dispatch the same day as they are ordered.

The whole of the fans are made throughout at Messrs. Veritys' Aston Works, Birmingham, where special fans are built to suit the particular requirements in different parts of the world. Fig. 4 is a view of the assembly shop at these works and fig. 3 shows the packing department.

Russian Notes.

The Pskoff Province.—The authorities of the Pskoff province have prepared a five-years' scheme of works of electrification, comprising the construction of hydro-electric works in Pskoff and Novorsjevsk. A hydro-electric works has just been completed in Ostroff. Ten peasant associations are also being formed for the execution of electrical schemes.

The Quality of Manufactures.—As a result of complaints made by the Commission for Ways and Communications and of other large customers concerning the inferior quality of certain electrical manufactures, an investigation is being made by the General Electrical Commission assisted by experts. The inquiry has already extended to the Moscow Cable Factory and the United Lamp Works, and the turn of the Insulator Works is about to arrive. It is proposed to exercise control over the quality of manufactures as a consequence of the investigation.

Inferior Electric Lamps.—The Central Laboratory of the Leningrad Electric Current undertaking has carried out a series of tests with lamps made by the Svetlana factory and the Moscow works of the State Electrical Trust. As a result it has been found that nearly all the lamps require double the quantity of energy which they should consume. The inferior quality of the lamps is attributed to the bad condition of the wolfram filaments. In these circumstances the factories concerned have been asked either to take measures to remedy the evil or to discontinue manufacture.

Works Managers in Conference.—During May a conference took place in Moscow of the managers of the different departments of the works embodied in the amalgamated heavy electrical engineering undertakings known as the State Electrical Trust. It was pointed out that many manufactures, which in pre-war times were imported from abroad, as for instance lamps, h.p. insulators, and large generators and transformers, were now turned out at the works of the amalgamated trust. This fusion has made possible the more economical use of the technical resources, but much remains to be done in this direction. In the course of further development it is considered necessary for a more systematic exchange of experience to be made with other countries and also between the different works in Russia. It was stated that the capacity of the home market considerably exceeded the growth of the production, particularly with regard to standard three-phase and d.c. machines. At the same time it was admitted that the quality of some manufactures turned out was low and improvement was essential.

The Donetz Anthracite Mines.—According to information received by the Donetz Coal Trust, the works being carried out at the Shteroff generating station are approaching completion and the station will be able to afford a supply of energy in September or October. The sub-stations are in an advanced state and the overhead lines have been erected, while the mines are being equipped with electric motors, centrifugal pumps, &c. Altogether the anthracite pits of four mining managements will be electrically equipped by next year.

The Coal Trust and the North Caucasian District Planning Commission are now in negotiation with a view to the construction of a large generating station in this region.

Turbine Construction.—The Leningrad Machine Trust has placed before the Industrial Bureau a statement concerning the construction of turbines, which was commenced at the works of the trust in the year 1922-23. Since then the trust has completed and erected 12 turbines of from 500 to 10,000 kW and of a total capacity of 28,750 kW. At present the trust has in hand 17 turbines of a total of 48,000 kW, while inquiries have also been received for a further 84 turbines. In order to meet the requirements the trust states that it is necessary to extend the works at a cost of 4,866,000 roubles, the extension being spread over three years.

Hydro-Electric Power for Leningrad.—According to a report presented to the Electric Planning Commission by M. A. I. Fidman in connection with the growth of the consumption in Leningrad, the stations supplying that city down to the time of the war used English coal as fuel, but at present they are working on wood, naphtha, and peat. It is considered that the future supply should be obtained from water power; the river Sver offers the greatest facilities for the purpose as it would permit of the erection of three stations of a total of 150,000 h.p. and thus be able to assist in meeting the requirements of Leningrad until 1934.

Pulverised Coal.—The Electric Planning Committee has authorised an expenditure of 17,000 roubles for the purpose of experiments in the consumption of pulverised coal at the "first" Leningrad generating station.

Railway Electrification.—The Council of Labour and Defence has approved a scheme of railway electrification prepared by the State Planning Commission for a period of five years, leaving the financial provision to be settled at the beginning of each budgetary year. A total expenditure of 101,000,000 roubles is contemplated in the five years, of which 4 millions is being spent this year; 13½ millions is proposed for next year, 22 millions in 1927-28, 27 millions in 1928-29, and 35 millions in 1929-30. Besides the suburban lines in Moscow and the North, which have been referred to on former occasions, the project includes the conversion of the Leningrad lines, and those at Alexandrovsk, Kursk and Nischni-Novgorod.

Railway Construction.—It was recently announced from Baku that the construction of the Sabunchi electric railway was approaching completion. The overhead line between Baku, Sabunchi, and Surachani was ready, and the opening of the railway was expected to take place in February.

Electricity from Finland.—It is announced from Leningrad that the question of purchasing energy from the hydro-electric works now being established on the River Vuoxen, Finland, has been settled. Negotiations are now proceeding with regard to the time of delivery and the construction of the transmission line of a length of about 132 miles. The station in question is to be completed by the end of 1927 and according to the agreement entered into, a supply to Leningrad is to be effected at the beginning of 1928, the demand being 40,000 kW, increasing later to 60,000 kW. The transmission line and technical equipment will be defrayed out of funds provided by the Supreme Council of National Economy.

A Large Station.—It is reported from Kharkoff that preparatory works have been completed for the construction of a large generating station in the town of Chugueve, which will supply energy in the district of Kharkoff. The initial capacity will be 32,000 kW, and will subsequently be increased to 82,000 kW. It is said that the necessary machines have already been ordered from abroad, and that 2,000 men will be employed on the erection of the buildings this summer.

Budget Assignments for Electrification. — The State Planning Commission has approved the method of allotting the total sum of 69,100,000 roubles assigned in the budget for 1925-26 for works of electrification. Of this total the sum of 40 millions is proposed to be devoted to the extension of the regional stations of primary importance, 9,710,000 roubles to the secondary stations, and the balance to other works.

The Productive Programme.—As the highest controlling authority in the matter, the Council of Labour and Defence has just approved the productive programme of the electrical manufacturing industry as submitted by the Supreme Council of National Economy. According to this programme, the output of the industry is to exceed by 63 per cent. in 1925-26 that of the past year. But even the realisation of the scheme will still leave it impossible fully to satisfy the requirements of the country, as the absorbing capacity of the market is now twice that which was manifested in the pre-war period. The value of the gross production in 1925-26 is estimated at 104,900,000 pre-war roubles. The capital expenditure will be 13,000,000 roubles, almost all of which will be devoted to the extension and re-equipment of the existing manufacturing works. With the object of reducing the exceptionally high costs of producing machines and apparatus, the obligation has been laid upon the Supreme Council to see that mass production is undertaken and to take steps to ensure the development of the supplies of raw and semi-finished materials for the electrical industry. At the same time measures are to be taken to increase the efficiency of labour which is said to be disproportionate to the rates of wages which are now paid.

The Volkhoff Hydro-Electric Works.—Having returned from a lengthy stay abroad, Mr. Graftio, the chief engineer of this works, is reported to have stated that he had ensured the delivery of the plant ordered abroad. All accounts had been regulated with the Vickers Co., which had executed the orders given, but had held back the delivery. The works would be ready next December; the erection of seven turbines and four generators had been completed. It was expected that energy would be available from two sets in September.

Telephone Development.—According to a report presented by the electrical section of the Commission on the Restoration of Capital in Industry, the increase in telephone apparatus amounted to 16 per cent. in 1923, 16.3 per cent. in 1924, and 27.5 per cent. in 1925. In order to meet the demand in the present year it will be necessary for the Low-Pressure Trust to manufacture 85,000 telephones and 40,000 line switchboards. The further expansion comprises the production of 100,000 telephones in 1926-27 and 60,000 line switchboards, and 110,000 and 70,000 respectively in 1927-28. At the end of five years the output of telephones must be 125,000, while it is foreshadowed that the manufacture of telegraph apparatus will be diminished in that period.

The Krivoi-Rog Ore District.—A scheme is under the consideration of the Southern Mining Trust for the construction of a works of a capacity of 30,000 kW for the purpose of supplying power and light to the iron ore mining district of Krivoi-rog. By way of a beginning it is proposed to install two 10,000-kW generating sets.

A New Form of Electric-Hydraulic Steering Gear.

By Dr. H. S. HELE-SHAW, F.R.S., and T. E. BEACHAM, B.Sc.

(*Abstract of a Paper read before the* INSTITUTE OF MARINE ENGINEERS.)

This paper describes some improvements which have recently been introduced in the electric-hydraulic system of steering for ships.

The electric-hydraulic system has been successfully adopted in the Merchant Service, not only for motor vessels but for steamships, and has also been employed by most of the principal navies of the world. No matter what success an invention may have, experience is sure to lead the way to further improvement, and in the new steering gear the following new features have been adopted :—A new, and it is believed, greatly improved variable stroke pump; a control valve for obviating the necessity of reversing the pump itself; and an automatic valve for preventing shocks from the action of the waves on the rudder causing any injury to the structure of the ship.

The pump, which is of the radial, central-valve type, is an improvement on the original Hele-Shaw pump in its application to the steering gear. In place of the rotary cylindrical valve taking the thrust on the cylindrical surfaces, the valve of the new pump runs on roller bearings. Instead of the pressure necessitating two different metals of unequal expansion to secure proper wearing action, the two parts can be made of the same metal (say, cast-iron), and thus very little clearance is necessary, assuring at all temperatures a minimum of leakage or slip. When the steering gear runs for a long period in the zero position, the danger of heating and abrasion of the cylindrical valve is entirely obviated. Thus it is not then necessary to arrange for leakage of oil (often considerable) to ensure lubrication. Another great improvement is in the greater silence of the new pump. The cause of the disagreeable buzzing sound in the old pump has now been discovered, and is entirely obviated in the new pump.

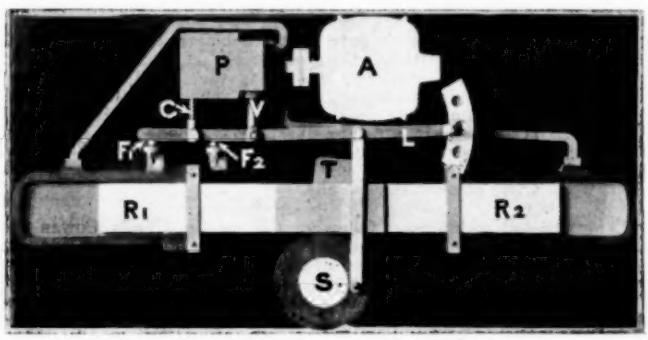


Fig. 1.—Model of Hele-Shaw Steering Gear.

The control valve does not rotate, but has merely a movement in the direction of its axis, enabling a working fit to be obtained, and resulting in an almost complete absence of leakage. The movement of the valves takes place from the central position; while the flow from the pump is always in the same direction before it reaches the valve, its flow from the valves to the two ports for the rams can be reversed. The stroke of the pump is governed by means of the pump spindle on one side of the zero position. Fig. 1 represents a working model, A being the electric motor, P the pump, R_1, R_2, the rams operating directly on the tiller T, and so producing the required movement of the rudder post S, L is the floating link, F_1 F_2 the two fulcrums. It will be easily seen that the two fulcrums produce exactly opposite movements on the pump spindle and control valve spindle respectively. A steering gear of this type has been made for a motor yacht and will replace the hand steering gear now in operation.

The new valve for preventing shocks on the rudder from being communicated to the deck of the ship is arranged to act when the rams, by their reversed motion, provide a pressure of less than half the maximum in the cylinders

Economy and the Minimum Charge.—The recent order made by the Mines Department called for a reduction in the consumption of coal, electricity and gas. As most electricity authorities have instituted a minimum charge to (*inter alia*) encourage the greater use of energy, an interesting point is raised, *viz.* :—Will consumers, who naturally endeavour to reach the minimum consumption, be encouraged to economise if the minimum charge is still insisted upon? The only effort to meet the situation which has so far come to our notice is that of the Electric Supply Corporation, Ltd., at Chelmsford, which has decided not to enforce the minimum charge during the continuance of the coal stoppage. It is probable, however, that the matter is engaging the attention of other suppliers.

Legal.

False "Characters" Charge.

BEFORE the Lancaster Borough magistrates, on May 30th, R. C. Milner, an electrical engineer, recently employed at the Upton Mental Hospital, Hoole, near Chester, was summoned under the Servants' Characters Act, 1792, for making false representations in that he unlawfully pretended to Major G. C. Milnes, electrical engineer to the Lancaster Corporation, that he had been in the service of the Bolton and Salford Corporations, whereas he had never actually so served. Two summonses had been issued, and defendant, who was represented by Mr. J. P. Elsden, barrister, Chester, pleaded guilty.

The Town Clerk of Lancaster (Mr. R. M. Middleton) who prosecuted on behalf of the Lancaster Corporation, said that the information was originally laid in August, 1925, but there had been difficulties in serving the summons because the defendant absolutely denied he was the man concerned. In July, 1925, Major Milnes advertised in the ELECTRICAL REVIEW for a shift charge engineer. Twenty-five applications were received, amongst them one from the defendant, signed "R. C. Milner." The application was very striking, and defendant interviewed Major Milnes, who told him that his face was familiar. Defendant suggested that he might have seen him in the Engineers' Clubs in Manchester or London, but Major Milnes was not a member of either club. Major Milnes then recalled an interview with a "Rollo Milton" in 1923 regarding an application for the position of mains superintendent. He came to the conclusion that they were the same person. Further inquiries disclosed that Milner did not possess the experience claimed in his application, and the testimonials were not from the people he pretended they were from. He had never been in the service of Bolton, Salford, or Eccles. With reference to a statement that he was three years senior engineer with the Leicestershire and Warwickshire Electric Power Co., he was only there three weeks. When the company doubted his competence and called for his original testimonials, he said he would go to Manchester for them, but never returned. The Town Clerk said that a serious state of affairs was revealed. Had this man been placed in charge of a plant valued at £100,000 the whole of the town's electrical undertaking might have been in jeopardy. A long statement was received from the Electrical Power Engineers' Association, which the Town Clerk contended should be read in the interests of the public service, but the Bench would not admit it.

Major G. C. MILNES, borough electrical engineer, Lancaster, gave evidence, and said that he placed defendant on his short list purely on his paper qualifications when he applied for the position.

Mr. W. J. H. WOOD, electrical engineer at Bolton since 1913, said he had never seen the defendant before, and he had never given the defendant the testimonial produced. The statement that he was in the department four years was incorrect.

Mr. J. COLLINGE, works superintendent of the Salford Electricity Department since 1901, said he had never seen defendant, and had never given the testimonial produced.

Mr. ELSDEN, while agreeing the offence was serious, said the suggestion that the works might have suffered by the defendant's employment had not been supported by evidence. Defendant applied for membership of the Electrical Power Engineers' Association, but did not pay his subscription. He thought because he was not a member of that association he was being victimised, and conceived the idea of applying for a job in an assumed name.

The magistrates fined defendant £10 in the first case and £5 in the second, and ordered him to pay £5 5s. costs, or in default two months. He was given time to pay.

Reduction of Telephone Manufacturing Co.'s Capital.

IN the Chancery Division, on June 1st, Mr. Justice Romer heard a petition for sanction to a scheme of arrangement which involved the reduction of the capital of the Telephone Manufacturing Co., Ltd.

For the company, Mr. BISCHOFF said the company, with a capital of a million pounds, had had considerable success, and required further money for the business; the proposed scheme had been prepared for that.

On behalf of two shareholders, Mr. JOHNSTON said he opposed the petition, because there was nothing in the nature of arrangement about the scheme.

His Lordship approved the scheme, subject to certain variation, and dismissed the opposition.

Nelson Electric Co., Ltd.

IN the Companies Winding Up Court, on June 1st, Mr. Justice Romer heard a petition for the compulsory liquidation of the Nelson Electric Co., Ltd., presented by Mr. Eugene Durand, trading as C. Melin & Co., and Eugene Durand & Co., judgment creditor.

Appearing for the petitioning creditor, Mr. GEOFFREY HOWARD said the debt was for £763 9s., which was in part

for goods sold and delivered and in part for bills of exchange given for goods, and since judgment had been obtained on May 14th further bills had matured; the total amount now due to the petitioning creditor was £1,100. A list of other creditors had been handed in, representing a total of indebtedness of the company of £2,369. It appeared that shortly before one of the bills fell due debentures of £1,000 were created, and on April 23rd a receiver was appointed for £600 worth of those debentures, and had since carried on the business of the company.

For the company Mr. MOULD opposed a winding-up order, and read an affidavit of Sir William Henry, director and chairman of the company, from which, said counsel, it appeared that the company's complaint was that it was being made to pay for goods for which it was not liable and that it had not got full value for stock which it had bought. The company had been mishandled in the past, but there was confidence, now, of arranging a scheme to liquidate the company's liabilities in full.

Counsel, therefore, asked that the petition be allowed to stand over, and his Lordship granted an adjournment.

Compensation Awarded to Irish Electric Supply Co.

AT the Circuit Court, Killarney, County Kerry, before Judge E. J. McElligott, K.C., recently, Messrs. Mortimer Shea and John Sheehan, trading as the Kenmore Electric Supply Co., applied for £500 compensation in respect of a portion of machinery and plant of the concern that was destroyed on March 8th last at Gortahinny. After hearing the evidence, the Judge gave a decree for £60, to be levied of the Kenmore and Cappagh electoral divisions of the County Kerry, and allowed £4 4s. expenses.

Electrical Engineer Sentenced.

CHARLES B. SMITH, described as an electrical engineer, of Plymouth, was sentenced to three months' imprisonment by the local magistrates last week on five charges of theft and false pretences.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

The Resistance and Heating of Plunger-type Lampholders.

The comment made by Messrs. A. P. Lundberg & Sons in their letter in your issue of May 28th, and the article on page 689 in your issue of April 30th on the above subject, are very interesting to us, and we venture to suggest that the remedy to overcome this difficulty and the other weaknesses of plungers is to dispense with the plungers. In the J.K.W. Solid Contact Lampholder this is done without material alteration to general design, method of wiring, or appearance.

The J.K.W. Manufacturing Co., Ltd.
J. WILSON, *Director.*

Middlesbrough, *May 28th*, 1926.

Earth Tubes in Radio Sets.

I have read with interest Mr. Killingworth Hedges's letter in the "Correspondence" columns of the REVIEW for June 4th, in connection with my article on earth tubes in radio sets.

I quite agree with Mr. Killingworth Hedges that the efficiency of an earth pipe is as dependent upon its specific conditions as that of a connection made to a water pipe, and although I did not actually state this in so many words, I think I implied it in the latter part of my article.

I am afraid that I am not exactly clear as to the actual construction of the hollow earth pipe referred to, and the exact manner in which it functions during the dry weather. What is necessary, of course, is that the earth tube, plate, or whatever is used for the earth connection should be permanently in electrical contact with a large area of moist ground in the immediate vicinity of the aerial, and preferably directly beneath it. The statements in my article are based entirely on results obtained from water pipes, earth plates, mats, and the ordinary type of earth tube driven into the ground, the data having been obtained from a number of different localities, where various types of subsoil and ground conditions were available.

I note Mr. Killingworth Hedges's remarks concerning the particular tube, and I should certainly be very pleased to test one of these devices, which, I understand, are made by the G.E.C., should an occasion present itself.

Paul D. Tyers.

Watford, *June 7th.*

[The earth tube devised by Mr. Hedges was described in the ELECTRICAL REVIEW of May 3rd, 1918, and May 30th, 1924.—EDS. ELEC. REV.]

The Electrical Association for Women.

Annual Meeting and Luncheon.

THE first annual report of the Association, presented at the annual general meeting on June 4th, states that it was inaugurated in 1924 to interest and serve the cause of women in things electrical. The idea was first mooted by Mrs. M. L. Matthews, a member of the Women's Engineering Society, and that Society undertook the work of organisation. Great strides have been made since its inception, three branches having been formed—at Glasgow, Manchester, and Birmingham respectively. Other branches are in process of formation in S. Wales and Newcastle. Lectures and visits to places of interest were arranged for members throughout the year, including visits to power stations, electrical showrooms, and the E.L.M.A. Lighting Service Bureau, and lectures on the replacing of fuses, &c. The Association also arranged during the year a special course of evening lectures for saleswomen engaged in the electrical industry. These lectures proved to be a great success, and will be repeated in the coming autumn.

The Association is assisting in organising a big women's meeting in Glasgow on June 17th, in connection with the I.M.E.A. Convention. Dr. Christina Barrowman will lecture on the "Remedial Uses of Electricity."

The Association has received support from such bodies as the Institution of Electrical Engineers, the British Electrical Development Association, the Cable Makers' Association, and many other important electrical organisations. It has also been in touch with many electrical organisations in America, and sent a delegate to the National Electric Light Association's Convention at Atlantic City in May.

The Association gave evidence before a Committee set up by the Electricity Commissioners, on the Development of Domestic Electricity, this being the first time the Government heard the woman's point of view on matters electrical.

The immediate development of the work of the Association is the issue in June of a quarterly magazine to be called "The Electrical Age—for Women." This magazine will deal with practical matters of interest to women in the home and electrical housecraft generally.

At a luncheon following the meeting, Lady Cowan, vice-president (in the unavoidable absence of the president, Lady Astor, M.P.), presided over a large gathering of members and guests. After the loyal toast, Lt.-Col. Wilfrid Ashley, M.P., Minister of Transport, proposed "Electricity in the Service of Women," and described the Association as a very vigorous infant, 18 months old. Selling electricity was, he said, as important as generating it; that branch of the industry had not been pushed as well in this country as in the United States and Canada, where electricity in the home was a commonplace—here it was the exception. He used nothing but electricity to warm his own house. Let them all co-operate in putting the Electricity Bill through in the best possible form at the earliest possible moment—continued uncertainty was not good either for the industry or for the country, and the Government was willing to consider any suggested improvement in the Bill.

LADY COWAN, supporting the toast, said that electricity if properly used would relieve the burden of women and other workers, and the E.A.W. was going to remedy our backwardness by creating a demand for electrical and mechanical devices. Electricity, as she had recently seen, was a great help in the United States. The all-electric house ideal was nearer now owing to the interest of women in the subject.

SIR HUGO HIRST, proposing "The Electrical Association for Women," pointed out that British manufacturers, having to cope with 40 or 50 different systems of supply, could not avail themselves of mass production, and it was not their fault if electricity could not be supplied or goods manufactured as cheaply as they should be. He welcomed the Bill and hoped for the results that were so important to the Association. Men were not so well qualified as women to sell apparatus for the home to women; but this was not merely a question of selling, it was a question of service. To give that, the members must undergo training, and it was certain that if they took the matter seriously, they would find opportunities for remunerative employment. The servant question was going to be as prominent here as in the United States, and women would have to use labour-saving apparatus.

Responding, LADY BROOKS, C.B.E., J.P. (president of the Birmingham and Midlands Branch), said the E.A.W. came into existence at the right moment. The Birmingham Corporation undertaking was going ahead rapidly owing to the opening of showrooms; the work of women would hasten the process. They had to convert the conservative-minded working women to new ideas.

Alderman Mrs. HAMMER (chairman, E.A.W.) proposed "Our Guests," remarking that it was the first official birthday of the Association, which was growing rapidly. There were many all-electric houses in England, and more to come, as well as a "university" for training women. The Association had many good friends, and all were united in the common aim.

Mr. R. P. SLOAN, C.B.E., responded, and remarking that he had been accused of obstruction to the Bill, said that nothing was further from his desire. *Some* legislation should be carried through, and the opposition was constructive, not destructive. The phenomenal growth of the business in the North-East Coast area showed that he was out for the most

rapid development that was possible. A Bill was necessary, but the results would be disastrous if it were not framed on proper lines, and very important amendments were required. The excessive legislation in past years had bred constant uncertainty; they wanted a rest, and to get on with the job. He deprecated interference with private enterprise; the Bill, if passed in its present form, would hamper development. The experience of the recent strike had shown users of electricity that they could rely on a continuous supply. If all worked together, in a few years they would be up to the level of the United States and Canada—Bill or no Bill.

Reviews.

The Red Club. By H. R. TAUNTON. Pp. 282. London: Hurst & Blackett, Ltd. Price, 7s. 6d. net.

In this well-written and highly imaginative novel, Mr. Taunton, who is an electrical contractor and an old contributor to our pages, paints the possible consequences of the election of a Bolshevist House of Commons with such obvious sincerity and with such plausibility that the reader is relieved to find at the end that there is still hope for Britain and that red revolution is a bogey and nothing more. Michael P. Schwartz, a German-American millionaire, has matured a plan to wreck the British Empire when he finds an unexpected obstacle in John Sydney, a candidate for Parliament in the coming election that is to return a Bolshevist Government. Sydney's opponent is a follower of Schwartz and organises riotous scenes during the canvassing, the result of which may or may not come as a surprise to the reader. How Sydney falls in love at first sight with Schwartz's ward, how he is kidnapped by the Reds, and how his friends try to save his life in time to rescue the charming ward from captivity and possible death, form the main plot of the story. This is not, however, simply a love story and nothing more. It is true that some of the incidents are too melodramatic and, it is hoped, too impossible for England; but they owe their exaggeration to Mr. Taunton's earnest endeavour to warn the patriotic Briton against the very real dangers to which his easy-going trustfulness has always laid him open.

Broadcast Reception in Theory and Practice. By J. LAURENCE PRITCHARD, F.R.Ae.S. Pp. xii + 259; figs. 163. London: Chapman & Hall, Ltd. Price, 8s. 6d. net.

Mr. Pritchard tells us in opening his preface that "this book is intended for that large and growing class of wireless enthusiasts who wish to do a little more than construct wireless sets from given instructions." It has thus at the start a distinct advantage over many books recently published on radio telephony in that it is written for one definite class of readers, and, as the author is Technical Editor of "Harmsworth's Wireless Encyclopedia," it has the additional advantage of having been written by one who knows the wants of that class of readers, and how their wants can be adequately met.

Provided "the wireless enthusiast" has an elementary knowledge of mathematics, the principles of electricity, and the use of tools, he cannot fail to be benefited by a study of this book, generally as a text book, or more narrowly as a book of reference in those times of doubt or trial, the inevitable crosses of all enthusiasts.

The contents of the book cannot be summed up better than in the words of the title, and the amateur experimenter will find in its pages a self-contained, accurate and up-to-date exposition of the theory and practical application of the principles of broadcast reception.

It is interesting, and possibly prophetic, to find that Mr. Pritchard, like Sir Oliver Lodge in his latest book on wireless, recommends the student to use units of length for capacity and inductance, and it is refreshing to find that he strongly recommends the use of really good transformers and ample batteries, as there is certainly a tendency at the present time for experimenters to spoil their work by ill-advised economy on these two important items in their installations.

In addition to many illustrations, much useful information is given in the form of tables and curves.

This is a book which we hope will be welcomed, as it deserves to be, by a large circle of serious amateur experimenters.

Insulated Electric Cables. Part I. Materials and Design. By C. J. BEAVER, M.I.E.E. Pp. 264; figs. 71. London: Ernest Benn, Ltd. Price 36s. net.

Mr. Beaver needs no introduction to our readers. For many years he has been one of the leading authorities on questions affecting the design and manufacture of cables, and has made valuable contributions to our knowledge of the subject. He has now laid both cable makers and cable users under a further debt of gratitude by putting before them in a concise form the results of long and active experience in the industry. He has produced a valuable book of reference which we think will be the standard work on cables for a long time to come.

The volume which we have received is the first of two, and deals with materials and design. Vol. II, which will appear later, will be devoted to manufacture, testing and use.

In Vol. I the author first traces briefly the development of electric cables over the past 30 or 40 years, and then devotes half the book to a very able and detailed examination of the wide range of raw materials employed as conductors, insulators, and for protective purposes in modern cable manufacture. Design problems, which constitute the second half of the volume, are similarly divided; but, owing to the complicated nature of dielectric knowledge, the greater part of this space is devoted to the consideration of different types of dielectrics, their various electrical, physical, mechanical and chemical properties, and to the several important factors controlling voltage rating.

The book is well illustrated, and contains a mass of valuable data embodied in the form of tables and curves. The diagrams are well drawn, though we must take exception to fig. 31 on p. 170. In plotting the connection between the viscosity and temperature of different cable compounds the author has made the abscissae, instead of the ordinates, the dependent variable. These curves would also have been of greater value if they had been carried to lower temperatures, but we suspect that the limitation was not lack of appreciation of the point so much as difficulty in measuring the values with the particular viscometer used. We feel, too, that it might have been wiser in connection with Table VI of lead analyses, on p. 109, not to have given so many decimal places in the impurity content. The table, as it stands, will give users a wrong impression of the accuracy of ordinary everyday analyses.

Generally speaking, the information contained in the volume is well up-to-date, and shows that the author has kept a watchful eye on the mass of material which has appeared during the past few years. This flood of new developments must have embarrassed him during the preparation of the chapters, and we see that, although he has caught copper cadmium, on p. 53, he has himself been caught by the price of rubber on p. 90.

The very complete treatment of raw materials is evidently based on a long experience, and many readers will find the tracing of the materials back to their origin an absorbing study. There will be some, however, who will feel that the author has gone further back and into greater detail than is justified by the title of the book. The refining of copper and aluminium, for instance, are dealt with very fully, and we fear that, interesting as these origins are, the seeker after cable knowledge may be distracted rather than helped. The shape of the bed in a paper hollander is a long way removed from cable manufacture, and the inclusion of detailed information on the sizing of paper or on the manufacture of wagon grease is evidence rather of the cathocity of the author's interests than of their importance to the subject in hand.

The author is not always strictly logical. For instance, he says on p. 168 that the chief object of using a wood-pulp paper is economy in first cost, bearing in mind, presumably, his own test results shown in the curves on pages 246 and 247, and then proceeds to talk of the futility of comparing the properties of papers on the basis of composition when texture may be the deciding factor. We can scarcely think that the widespread and growing feeling against manila paper is due to the cause laid down by the author on p. 57. The results of electrical and ageing tests made by other investigators are surely more probable reasons than any question of foreign competition.

To carry our criticism over to the opposite side, we feel that in some respects the author is too modest. The reader wonders, for instance, why, on p. 21, he quotes two out-of-date authorities where he might give his own view at the time of writing, and in discussing the merits of rosin oil and mineral oil on p. 67, he withholds his own personal opinion on their relative merits.

In the matter of nomenclature the opening of Section III—Design—with the valuable and spirited attack on philological inexactitudes and other enemies to clearness in discussion, was a happy thought. What a pity, then, that the author from page 1 to page 128 vacillates between the use of the names resin and rosin for the same material!

A striking feature of the book is the evidence in every chapter of the author's practical knowledge of the subject. Good examples are the interesting and chatty pages 102-105 on varnished cambric cables, and pages 154-156 on shaped conductors. Again, on page 175, Mr. Beaver fulfils the function of an authority by dispelling errors with no uncertain hand. The inter-action of the copper conductor, its tinned coating, the rubber, and the sulphur, in a rubber cable are very much misunderstood, but the author's explanation puts the matter very clearly; in fact, the entire chapter on rubber dielectrics being so concise will prove a welcome addition to the existing literature.

Chapters IX and X, on dielectric properties and voltage rating, constitute a valuable summary of a wide and difficult subject showing the author's extensive knowledge of the work published and his appreciation of the limitation of existing theories.

The absence of any mention of the design of dry-core telephone cables strikes us as a serious omission in view of the broad title of the book, particularly as, by the adoption of a paper less than 7 mils thick for the present 264 pages, a chapter on this subject might still have been squeezed in without reducing the dignity of the volume with its 3 lb. 5 oz. avoirdupois and high price, or cutting out the twenty-four pages of advertisements which get in the way whenever the index is required.

In addition to producing a valuable technical treatise Mr. Beaver has rendered a great service to the British cable industry by showing the extent to which attention is given to detail in the production of British cables and, although his publishers

have seen fit to include a foreign manufacturer among the advertisements, we feel that cable users reading the book will be quite satisfied that in placing their orders for cable in this country they are reaping the benefits of the highest scientific and technical skill.

We shall look forward to the appearance of Vol. II with a lively interest.

Parliamentary News.

[By Our Special Parliamentary Reporters.]

Third Readings.—In the House of Lords on June 3rd, the Colwyn Bay Urban District Council Bill and the Kidderminster and Stourport Tramways Bill were read a third time and passed. The Ascot District Gas and Electricity Bill was read a third time in the House of Commons on June 4th.

Post Office Tube.—On June 4th, Col. DAY asked the Postmaster-General if he would state the amount already spent on the work in connection with the Post Office tube railway; the estimated cost for the completion of the scheme; and when it was anticipated that the railway would be ready for operation.

Sir W. MITCHELL-THOMSON said that the amount expended to date was £1,420,000, and it was estimated that about £260,000 would be required to complete the undertaking. It was hoped that the railway would be available for traffic in the autumn.

Breach of Contract by Public Works Employés.—On June 7th, Sir EVELYN CECIL asked the Home Secretary if he would state what steps his department took under Section 4 of the Conspiracy and Protection of Property Act, 1875, and Section 31 of the Electricity (Supply) Act, 1919, for breach of contract against persons employed in the public supply of gas, water, or electricity; and how the posting-up of a notice of these sections in the works as required by law was ensured.

Capt. HACKING, the Under Secretary to the Home Office, said that the matter did not fall within the scope of the Home Office. It was open to any person who was aggrieved to take action if an offence was committted.

Trade-Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from the dates mentioned. In the case of foreign applications, the name and address of the British representatives are also given :—

May 19th.

Design only. No. 457,156. Class 8. Portable instruments and apparatus for use in radio-telegraphy and telephony.—Pell, Cahill & Co., Ltd., 64, Newman Street, W.1.

Resistoflex. No. 468,353. All goods in Class 8.—Spicers, Ltd., 19, New Bridge Street, E.C.4.

Rubite. No. 468,725. Class 8. Electric cables.—W. Brown & Co. (Engineers), Ltd., 89, Douglas Street, Glasgow.

May 26th.

Lewcos. No. 464,502. Class 8. Electric coils. Lewroidal. No. 468,849. Class 8. Coils for use in radio-telegraphy and telephony.—London Electric Wire Co. & Smiths, Ltd.

Orion. No. 465,674. Class 8. Electrical appliances of all kinds.—Magyar Wolframlampa-Gyar Kremenezky Janos Reszvenytarsusag, Budapest. (Dicker and Pollak, 20-23, Holborn, E.C.1.)

Cossor. No. 466,824. Class 8. Thermionic valves, electric lamps (philosophical), vacuum tubes, electric signs, X-ray tubes and apparatus, electric batteries, meters, resistances, switchboards, contact breakers, induction coils, transformers, radio-telephonic and telegraphic apparatus, electric furnaces (experimental), &c.—A. C. Cossor, Ltd.

Weilo. No. 468,248. Class 8. Transformers and radio-telegraphic and telephonic appliances.—H. Wieland, Berlin, S.W.61. (W. Bryson, 29, Southampton Buildings, W.C.2.)

Ivric. No. 463,852. Class 50. An electrical insulating material made principally of ground bone and casein in rods and sheets, and electrical insulators made of such material.—Completion Syndicate, Ltd., 136-138, Bishopsgate, E.C.2.

Linerfex. No. 468,584. Class 50. Insulating material for electrical purposes.—The Ioco Rubber & Waterproofing Co., Ltd.

Published Specifications.

Compiled expressly for this journal by Patent Agents.

The name of the applicant's patent agent, if any, will be found on the printed specification.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

28,000. "Electromagnetic mechanisms." Automatic Telephone Manufacturing Co., Ltd., and A. E. Hudd. November 22nd, 1924. (Addition to 195,824.) (251,317.)

1925.

2,413. "Electric batteries." British Battery Co., Ltd., and J. W. H. Reynolds. January 27th, 1925. (251,328.)

2,527. "Radio-receiving sets." C. C. Blackmore. January 28th, 1925. (251,332.)

2,534. "Telephone exchange systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.). (L. J. J. Schreiber). January 28th, 1925. (251,335.)

2,614. "Directional radio-receiving system." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.). (Western Electric Co., Inc.). January 29th, 1925. (251,337.)

2,617. "Electrical driving mechanism for rotary tools for use in the treatment of leather and hides or skins." Etablissements Reynier (Soc. Anon.) and C. Szmukler. March 27th, 1924. (231,434.)

2,622. "Electrically-operated point or switch machines for railways." S. L. Glenn and E. E. Pierce. January 29th, 1925. (251,339.)

2,669. "Lamp signalling devices, particularly for use in controlling traffic." F. W. C. Bilby. January 30th, 1925. (251,340.)

2,685. "Electric secondary batteries or accumulators." H. F. Joel, sen. January 30th, 1925. (Addition to 230,184.) (251,342.)

2,797. "Electric telephones." M. Walker. January 31st, 1925. (251,349.)

2,936. "Electric condensers for use in wireless receiving apparatus." A. E. Peplow. February 2nd, 1925. (251,358.)

2,954. "Current transformers." E. Pfiffner. February 2nd, 1924. (228,575.)

3,210. "Impulse transmitters for use in telephone or like systems." Automatic Telephone Manufacturing Co., Ltd. June 7th, 1924. (235,136.)

3,214. "Sound-radiating means suitable for use with loud-speaking telephonic receivers and other sound producing or reproducing apparatus." E. A. Graham. February 4th, 1925. (251,365.)

3,520. "Electric circuits supplied by electric generators driven by windmills." L. Constantin and P. Fortier-Beaulieu. February 12th, 1924. (229,291.)

3,891. "Electrical circuits for wireless telegraphy, telephony, or the like." C. A. Cleghorn. February 11th, 1925. (Cognate application 8,340/25.) (251,374.)

3,958. "Electric discharge devices." Westinghouse Electric & Manufacturing Co. February 20th, 1924. (229,654.)

4,417. "Electrical connector." L. F. Summers. February 17th, 1925. (251,377.)

5,211. "Trunk offering final selectors for use in telephone systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.) and L. P. Lowry. February 25th, 1925. (251,385.)

5,688. "Automatic or semi-automatic telephone systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.) and J. R. Gould. March 2nd, 1925. (251,387.)

7,016. "Holders for thermionic valves." H. Terry & Sons, Ltd., and A. V. Terry. March 16th, 1925. (251,397.)

7,777. "Electric differential control system." E. Granat and Compagnie des Forges et Acieries de la marine et d'Homecourt. April 19th, 1924. (232,571.)

7,902. "Thermionic valves." Edison Swan Electric Co., Ltd., and T. W. Price. March 24th, 1925. (251,406.)

8,171. "Detectors for high-frequency electrical oscillations." H. Wade (Carborundum Co.). March 26th, 1925. (251,408.)

8,247. "Control of electric switches operated by impulses." Siemens Bros. and Co., Ltd., and H. E. Humphries. March 27th, 1925. (251,410.)

8,470. "Illuminated signs." E. C. R. Marks (Wayne Tank & Pump Co.). March 30th, 1925. (251,414.)

8,964. "Control of dynamo-electric machines." British Thomson-Houston Co., Ltd. April 3rd, 1924. (231,891.)

9,504. "Headlamps suitable for use on motor-cars." G. Herbert. April 14th, 1925. (Cognate application 12,176/25.) (251,417.)

10,276. "Detecting devices for electric circuits." British Thomson-Houston Co., Ltd., H. C. Wheat, and F. M. Cocksedge. April 20th, 1925. (251,425.)

11,046. "Method and device for detecting and locating ores by electromagnetic means." E. C. R. Marks (Aktiebolaget Elektrisk Malmletning). April 28th, 1925. (251,429.)

12,428. "Electric motor-starting switches." Brookhirst Switchgear, Ltd., and J. A. Hirst. May 13th, 1925. (251,440.)

13,137. "Shades or reflectors for electric lamps." R. R. Palmer. May 20th, 1925. (251,445.)

14,846. "Electrical generators." D. Mendelson. June 8th, 1925. (251,461.)

16,778. "X-ray tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 23rd, 1924. (237,580.)

16,843. "Electrical regulator systems and devices." Metropolitan-Vickers Electrical Co., Ltd. October 14th, 1924. (241,523.)

17,648. "X-ray apparatus." Dr. W. Moppett. July 9th, 1925. (Convention date not granted.) (251,477.)

17,922. "Electric furnaces." E. C. R. Marks (Scovil Manufacturing Co.). July 13th, 1925. (251,484.)

17,928. "Thermionic valve holders." W. H. Dovey. July 13th, 1925. (251,485.)

18,121. "Mercury lamps." H. Nagaoa, T. Asada, and T. Machida. July 15th, 1925. (251,486.)

18,814. "Plates for electric storage batteries or accumulators." G. F. Judd and W. A. Millington. July 23rd, 1925. (251,487.)

18,815. "Electric storage batteries or accumulators." G. F. Judd and W. A. Millington. July 23rd, 1925. (251,488.)

18,816. "Electrodes for electric storage batteries or accumulators." G. F. Judd and W. A. Millington. July 23rd, 1925. (251,489.)

19,474. "System for transmitting electrical impulses, particularly for use in automatic telephone exchange systems." A. Barnay. November 8th, 1924. (242,594.)

20,434. "Electrode holders for electric furnaces." D. M. Crist. August 14th, 1925. (251,497.)

22,017. "Electrode-holder for electric furnaces." Studien Ges. fur Wirtschaft U. Industrie. September 5th, 1924. (239,522.)

22,026. "Control of polyphase crane-driving or like motors." J. W. Kirkland (Allgemeine Elektricitats-Ges.). September 3rd, 1925. (251,503.)

22,132. "Electric connecting devices provided with automatic cut-outs." E. Blattmann. September 4th, 1925. (251,504.)

23 754. "Thermostatic switches for electric heating elements." M. Kletter. September 23rd, 1925. (251,510.)

24,365. "Bushings for electrical apparatus." British Thomson-Houston Co., Ltd. September 30th, 1924. (240,839.)

25,241. "Wireless antennæ." J. M. Clark. October 9th, 1925. (251,521.)

25,409. "Switches for electric pocket-lamps and portable electric hand-lamps." Elektrotechnische Fabrik Schmidt & Co. Ges. February 28th, 1925. (248 322.)

26,926. "Fixing device for the magnet of an electricity meter." Soc. Genevoise d'Instruments de Physique. February 3rd, 1925. (247,151.)

26,927. "Ferraris electricity meter." Soc. Genevoise d'Instruments de Physique. July 4th, 1925. (251,536.)

27,093. "Reactive component indicating meter or wattless component energy meter according to the induction principle." Landis & Gyr Soc. Anon. December 24th, 1924. (245,074.)

27,723. "Apparatus for selectively cutting-out a rectifier when flashing-over occurs therein." Akt. Ges. Brown, Boveri et Cie. August 31st, 1925. (251,539.)

28,062. "Insulators." M. F. H. Gouverneur. November 11th, 1924. (242,983.)

28,139. "Arrangement for cooling the stators of electrical machines." Thyssen & Co., Akt. Ges., A. Glaubitz, and R. Simeith. November 9th, 1925. (251,542.)

28,624. "Radiating antenna systems." British Thomson-Houston Co., Ltd. November 25th, 1924. (243,796.)

31,932. "Electrically-actuated horns and the like." G. Ingrassia. December 18th, 1924. (244,798.)

32,349. "Electric motor controllers." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). December 22nd, 1925. (251,559.)

1926.

1,934. "Electric fires or radiators." H. H. Berry. January 22nd, 1926. (251,568.)

2,126. "Traffic signalling systems." British Thomson-Houston Co., Ltd. January 24th, 1925. (246,515.)

4,706. "Thermal-electric generators." British Thomson-Houston Co., Ltd. March 31st, 1925. (250,187.)

4,892. "Vacuum electric tube devices." E. Y. Robinson and Metropolitan-Vickers Electrical Co., Ltd. December 31st, 1924. (Divided application on 251,673.) (251,572.)